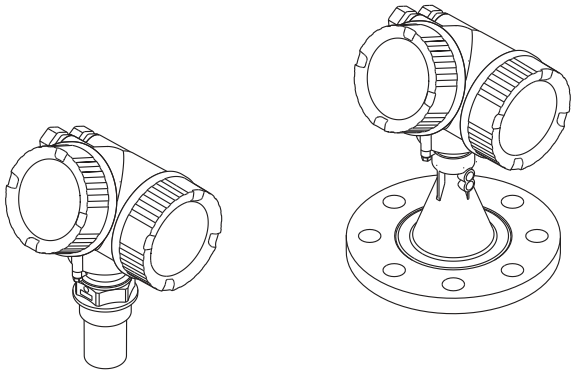
BA01120F/00/EN/04.18
71396470
2018-04-12

01.01.zz (Device firmware)

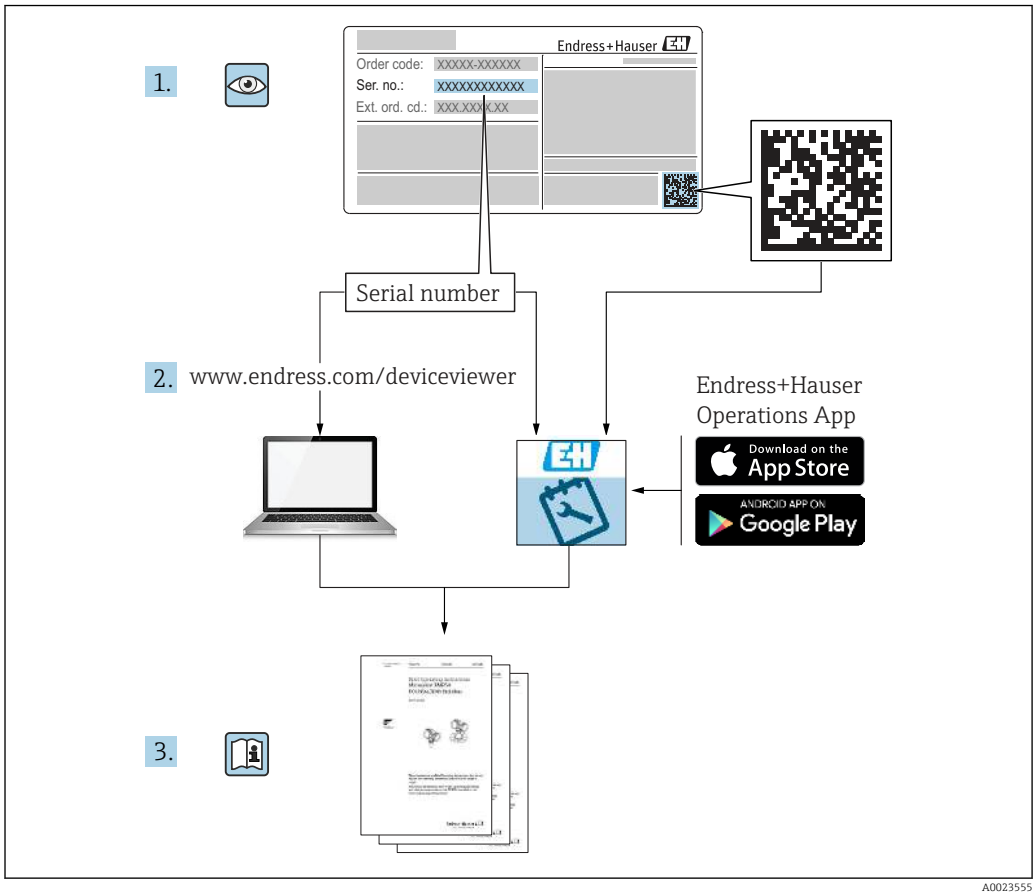


# Operating Instructions
# **Micropilot FMR50 FOUNDATION Fieldbus**

Free space radar



Endress+Hauser
People for Process Automation


1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXX
Ext. ord. cd.: XXX XXX XX
Serial number
2. www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the App Store
ANDROID APP ON Google Play
3.
A0023555

# Table of contents


1 Wichtige Hinweise zum Dokument . . . . . 6
1.1 Document function . . . . . 6
1.2 Symbols . . . . . 6
1.2.1 Safety symbols . . . . . 6
1.2.2 Electrical symbols . . . . . 6
1.2.3 Tool symbols . . . . . 6
1.2.4 Symbols for certain types of information . . . . . 7
1.2.5 Symbols in graphics . . . . . 7
1.2.6 Symbols at the device . . . . . 8
1.3 Additional documentation . . . . . 8
1.4 Terms and abbreviations . . . . . 9
1.5 Registered trademarks . . . . . 10

2 Basic safety instructions . . . . . 11
2.1 Requirements for the personnel . . . . . 11
2.2 Designated use . . . . . 11
2.3 Workplace safety . . . . . 12
2.4 Operational safety . . . . . 12
2.5 Product safety . . . . . 12
2.5.1 CE mark . . . . . 12
2.5.2 EAC conformity . . . . . 13
2.6 Safety Instructions (XA) . . . . . 13

3 Product description . . . . . 16
3.1 Product design . . . . . 16
3.1.1 Micropilot FMR50 . . . . . 16
3.1.2 Electronics housing . . . . . 16

4 Incoming acceptance and product identification . . . . . 17
4.1 Incoming acceptance . . . . . 17
4.2 Product identification . . . . . 17
4.2.1 Nameplate . . . . . 18

5 Storage, Transport . . . . . 19
5.1 Storage conditions . . . . . 19
5.2 Transport product to the measuring point . . . . 19

6 Installation . . . . . 20
6.1 Installation conditions . . . . . 20
6.1.1 Mounting position . . . . . 20
6.1.2 Vessel installations . . . . . 21
6.1.3 Reduction of interference echoes . . . . 21
6.1.4 Measurement in a plastic vessel . . . . . 22
6.1.5 Optimization options . . . . . 22
6.1.6 Beam angle . . . . . 23
6.2 Measuring conditions . . . . . 24
6.3 Installation in vessel (free space) . . . . . 25
6.3.1 Horn antenna encapsulated (FMR50) . . . . . 25
6.3.2 Horn antenna with slip-on flange (FMR50) . . . . . 26
6.3.3 Horn antenna with mounting bracket (FMR50) . . . . . 28
6.3.4 Measurement from the outside through plastic walls (FMR50/ FMR51) . . . . . 28
6.4 Installation in stilling well . . . . . 29
6.4.1 Recommendations for the stilling well . . . . . 29
6.4.2 Examples for the construction of stilling wells . . . . . 30
6.5 Installation in bypass . . . . . 31
6.5.1 Recommendations for the bypass pipe . . . . . 31
6.5.2 Example for the construction of a bypass . . . . . 32
6.6 Container with heat insulation . . . . . 33
6.7 Turning the transmitter housing . . . . . 33
6.8 Turning the display . . . . . 34
6.8.1 Opening cover . . . . . 34
6.8.2 Turning the display module . . . . . 34
6.8.3 Closing electronics compartment cover . . . . . 35
6.9 Post-installation check . . . . . 35

7 Electrical connection . . . . . 36
7.1 Connection conditions . . . . . 36
7.1.1 Terminal assignment . . . . . 36
7.1.2 Cable specification . . . . . 38
7.1.3 Device plug connectors . . . . . 39
7.1.4 Supply voltage . . . . . 40
7.1.5 Overvoltage protection . . . . . 40
7.2 Connecting the measuring device . . . . . 41
7.2.1 Opening connection compartment cover . . . . . 41
7.2.2 Connecting . . . . . 42
7.2.3 Plug-in spring-force terminals . . . . . 42
7.2.4 Closing connection compartment cover . . . . . 43
7.3 Post-connection check . . . . . 43

8 Operation options . . . . . 45
8.1 Overview . . . . . 45
8.1.1 Local operation . . . . . 45
8.1.2 Operation with remote display and operating module FHX50 . . . . . 46
8.1.3 Remote operation . . . . . 46
8.2 Structure and function of the operating menu . . . . . 48
8.2.1 Structure of the operating menu . . . . 48

8.2.2 User roles and related access authorization . . . . . 50
8.2.3 Data access - Security . . . . . 50
8.3 Display and operating module . . . . . 55
8.3.1 Display appearance . . . . . 55
8.3.2 Operating elements . . . . . 58
8.3.3 Entering numbers and text . . . . . 59
8.3.4 Opening the context menu . . . . . 61
8.3.5 Envelope curve on the display and operating module . . . . . 62

**9 Integration into a FOUNDATION Fieldbus network . . . . . 63**
9.1 Device Description (DD) . . . . . 63
9.2 Integration into the FOUNDATION Fieldbus network . . . . . 63
9.3 Device identification and addressing . . . . . 63
9.4 Block model . . . . . 65
9.4.1 Blocks of the device software . . . . . 65
9.4.2 Block configuration when device is delivered . . . . . 66
9.5 Assignment of the measured values (CHANNEL) in an AI Block . . . . . 66
9.6 Index tables of Endress+Hauser parameters . . 66
9.6.1 Setup Transducer Block . . . . . 67
9.6.2 Advanced Setup Transducer Block . . . 67
9.6.3 Display Transducer Block . . . . . 68
9.6.4 Diagnostic Transducer Block . . . . . 69
9.6.5 Expert Configuration Transducer Block . . . . . 70
9.6.6 Expert Information Transducer Block . . . . . 72
9.6.7 Service Sensor Transducer Block . . . . 72
9.6.8 Service Information Transducer Block . . . . . 73
9.6.9 Advanced Diagnostics Transducer Block . . . . . 73
9.7 Methods . . . . . 74

**10 Commissioning via wizard . . . . . 75**

**11 Commissioning via operating menu . . . . . 76**
11.1 Installation and function check . . . . . 76
11.2 Setting the operating language . . . . . 76
11.3 Configuration of a level measurement . . . . . 77
11.4 Recording the reference curve . . . . . 79
11.5 Configuration of the on-site display . . . . . 80
11.5.1 Factory settings of the on-site display . . . . . 80
11.5.2 Adjustment of the on-site display . . . 80
11.6 Configuration management . . . . . 81
11.7 Protection of the settings against unauthorized changes . . . . . 82

**12 Commissioning (block-based operation) . . . . . 83**
12.1 Function check . . . . . 83
12.2 Block configuration . . . . . 83
12.2.1 Preparatory steps . . . . . 83
12.2.2 Configuring the Resource Block . . . . . 83
12.2.3 Configuring the Transducer Blocks . . . 83
12.2.4 Configuring the Analog Input Blocks . . . . . 84
12.2.5 Additional configuration . . . . . 84
12.3 Scaling of the measured value in an AI Block . . 84
12.4 Language selection . . . . . 85
12.5 Configuration of a level measurement . . . . . 86
12.6 Configuration of the on-site display . . . . . 87
12.6.1 Factory settings of the on-site display for level measurements . . . . . 87
12.7 Configuration management . . . . . 87
12.8 Configuration of the event behavior according to the FOUNDATION Fieldbus specification FF912 . . . . . 89
12.8.1 Groups of events . . . . . 90
12.8.2 Allocation parameters . . . . . 92
12.8.3 Configurable area . . . . . 95
12.8.4 Transmission of the event meassages to the bus . . . . . 96
12.9 Protection of the settings against unauthorized changes . . . . . 96

**13 Diagnostics and troubleshooting . . . 97**
13.1 General trouble shooting . . . . . 97
13.1.1 General errors . . . . . 97
13.1.2 Parametrization errors . . . . . 97
13.2 Diagnostic information on local display . . . . . 99
13.2.1 Diagnostic message . . . . . 99
13.2.2 Calling up remedial measures . . . . . 101
13.3 Diagnostic event in the operating tool . . . . . 102
13.4 Diagnostic messages in the DIAGNOSTIC Transducer Block (TRDDIAG) . . . . . 103
13.5 Diagnostic list . . . . . 103
13.6 Overview of diagnostic events . . . . . 104
13.7 Event logbook . . . . . 105
13.7.1 Event history . . . . . 105
13.7.2 Filtering the event logbook . . . . . 106
13.7.3 Overview of information events . . . . 106
13.8 Firmware history . . . . . 107

**14 Maintenance . . . . . 108**
14.1 Exterior cleaning . . . . . 108
14.2 Replacing seals . . . . . 108

**15 Repairs . . . . . 109**
15.1 General information on repairs . . . . . 109
15.1.1 Repair concept . . . . . 109
15.1.2 Repairs to Ex-approved devices . . . . 109
15.1.3 Replacement of an electronics module . . . . . 109

15.1.4 Replacement of a device . . . . . 109
15.2 Spare parts . . . . . 110
15.3 Return . . . . . 110
15.4 Disposal . . . . . 110

**16 Accessories . . . . . 111**

16.1 Device-specific accessories . . . . . 111
16.1.1 Weather protection cover . . . . . 111
16.1.2 Mounting nut G1-1/2 . . . . . 111
16.1.3 Variable flange seal for FMR50/ FMR56 . . . . . 112
16.1.4 Mounting bracket for wall or ceiling mounting of FMR50/FMR56 . . . . . 113
16.1.5 Installation bracket for FMR50 . . . . 114
16.1.6 Remote display FHX50 . . . . . 115
16.1.7 Overvoltage protection . . . . . 116
16.1.8 Bluetooth module for HART devices 117
16.2 Communication-specific accessories . . . . . 118
16.3 Service-specific accessories . . . . . 118
16.4 System components . . . . . 118

**17 Operating menu . . . . . 119**

17.1 Overview of the operating menu (display module) . . . . . 119
17.2 Overview of the operating menu (operating tool) . . . . . 125
17.3 "Setup" menu . . . . . 131
17.3.1 "Mapping" wizard . . . . . 138
17.3.2 "Analog input 1 to 5" submenu . . . . . 139
17.3.3 "Advanced setup" submenu . . . . . 141
17.4 "Diagnostics" menu . . . . . 180
17.4.1 "Diagnostic list" submenu . . . . . 182
17.4.2 "Event logbook" submenu . . . . . 183
17.4.3 "Device information" submenu . . . . . 184
17.4.4 "Measured values" submenu . . . . . 186
17.4.5 "Analog input 1 to 5" submenu . . . . . 187
17.4.6 "Data logging" submenu . . . . . 189
17.4.7 "Simulation" submenu . . . . . 192
17.4.8 "Device check" submenu . . . . . 197
17.4.9 "Heartbeat" submenu . . . . . 199

**Index . . . . . 200**

# 1 Wichtige Hinweise zum Dokument

## 1.1 Document function

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

## 1.2 Symbols

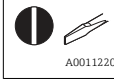
### 1.2.1 Safety symbols

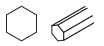
| Symbol | Meaning |
|---|---|
| DANGER | **DANGER!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury. |
| WARNING | **WARNING!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |
| CAUTION | **CAUTION!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury. |
| NOTICE | **NOTE!**<br>This symbol contains information on procedures and other facts which do not result in personal injury. |

### 1.2.2 Electrical symbols

| Symbol | Meaning |
|---|---|
| ⎓ | Direct current |
| ~ | Alternating current |
| ⎓ ~ | Direct current and alternating current |
| ⏚ | **Ground connection**<br>A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
| ⏚ | **Protective Earth (PE)**<br>A terminal which must be connected to ground prior to establishing any other connections.<br>The ground terminals are situated inside and outside the device:<br>▪ Inner ground terminal: Connects the protectiv earth to the mains supply.<br>▪ Outer ground terminal: Connects the device to the plant grounding system. |

### 1.2.3 Tool symbols

| Symbol | Meaning |
|---|---|
|  A0013442 | Torx screwdriver |
|  A0011220 | Flat blade screwdriver |

| Symbol | Meaning |
|---|---|
|  A0011219 | Cross-head screwdriver |
|  A0011221 | Allen key |
|  A0011222 | Hexagon wrench |

### 1.2.4 Symbols for certain types of information

| Symbol | Meaning |
|---|---|
|  | **Permitted**<br>Procedures, processes or actions that are permitted. |
|  | **Preferred**<br>Procedures, processes or actions that are preferred. |
|  | **Forbidden**<br>Procedures, processes or actions that are forbidden. |
|  | **Tip**<br>Indicates additional information. |
|  | Reference to documentation. |
|  | Reference to page. |
|  | Reference to graphic. |
|  | Notice or individual step to be observed. |
| 1., 2., 3... | Series of steps. |
|  | Result of a step. |
|  | Help in the event of a problem. |
|  | Visual inspection. |

### 1.2.5 Symbols in graphics

| Symbol | Meaning |
|---|---|
| 1, 2, 3 ... | Item numbers |
| 1., 2., 3... | Series of steps |
| A, B, C, ... | Views |
| A-A, B-B, C-C, ... | Sections |
|  | **Hazardous area**<br>Indicates a hazardous area. |
|  | **Safe area (non-hazardous area)**<br>Indicates the non-hazardous area. |

### 1.2.6 Symbols at the device

| Symbol | Meaning |
|---|---|
|  | **Safety instructions**<br>Observe the safety instructions contained in the associated Operating Instructions. |
|  | **Temperature resistance of the connection cables**<br>Specifies the minimum value of the temperature resistance of the connection cables. |

## 1.3 Additional documentation

| Document | Purpose and content of the document |
|---|---|
| Technical Information<br>TI01039F (FMR50) | **Planning aid for your device**<br>The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device. |
| Brief Operating Instructions<br>KA01124F (FMR50, FOUNDATION Fieldbus) | **Guide that takes you quickly to the 1st measured value**<br>The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning. |
| Description of Device Parameters<br>GP01017F (FMR5x, FOUNDATION Fieldbus) | **Reference for your parameters**<br>The document provides a detailed explanation of each individual parameter in the operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations. |
| Special documentation<br>SD01087F | **Functional Safety Manual**<br>The document is part of the Operating Instructions and serves as a reference for application-specific parameters and notes. |
| Special documentation<br>SD01870F | **Manual for Heartbeat Verification and Heartbeat Monitoring**<br>The document contains descriptions of the additonal parameters and technical data which are available with the **Heartbeat Verification** and **Heartbeat Monitoring** application packages. |

For an overview of the scope of the associated Technical Documentation, refer to the following:

- The *W@M Device Viewer* : Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

## 1.4 Terms and abbreviations

| Term/abbreviation | Explanation |
|---|---|
| BA | Document type "Operating Instructions" |
| KA | Document type "Brief Operating Instructions" |
| TI | Document type "Technical Information" |
| SD | Document type "Special Documentation" |
| XA | Document type "Safety Instructions" |
| PN | Nominal pressure |
| MWP | Maximum Working Pressure<br>The MWP can also be found on the nameplate. |
| ToF | Time of Flight |
| FieldCare | Scalable software tool for device configuration and integrated plant asset management solutions |
| DeviceCare | Universal configuration software for Endress+Hauser HART, PROFIBUS, FOUNDATION Fieldbus and Ethernet field devices |
| DTM | Device Type Manager |
| DD | Device Description for HART communication protocol |
| $\varepsilon_r$ (DC value) | Relative dielectric constant |
| Operating tool | The term "operating tool" is used in place of the following operating software:<br>▪ FieldCare / DeviceCare, for operation via HART communication and PC<br>▪ SmartBlue (app), for operation using an Android or iOS smartphone or tablet. |
| BD | Blocking Distance; no signals are analyzed within the BD. |
| PLC | Programmable Logic Controller |
| CDI | Common Data Interface |
| PFS | Pulse Frequence Status (Switching output) |
| MBP | Manchester Bus Powered |
| PDU | Protocol Data Unit |

## 1.5 Registered trademarks

**FOUNDATION™ Fieldbus**
Registered trademark of the FieldComm Group, Austin, Texas, USA

**Bluetooth®**
The Bluetooth® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

**Apple®**
Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S.and other countries. App Store is a service mark of Apple Inc.

**Android®**
Android, Google Play and the Google Play logo are trademarks of Google Inc.

**KALREZ®, VITON®**
Registered trademark of DuPont Performance Elastomers L.L.C., Wilmington, USA

**TEFLON®**
Registered trademark of E.I. DuPont de Nemours & Co., Wilmington, USA

**TRI CLAMP®**
Registered trademark of Alfa Laval Inc., Kenosha, USA

# 2 Basic safety instructions

## 2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
- Trained, qualified specialists must have a relevant qualification for this specific function and task.
- Are authorized by the plant owner/operator.
- Are familiar with federal/national regulations.
- Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:
- Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

## 2.2 Designated use

**Application and measured materials**
The measuring device described in these Operating Instructions is intended for the continuous, contactless level measurement of liquids, pastes and sludge. The device can also be freely mounted outside closed metal vessels (e.g. above basins, open channels or open piles) because of its operating frequency of about 26 GHz, a maximum radiated pulsed power of 5.7 mW and an average power output of 0.015 mW (for the version with advanced dynamics: maximum pulse power: 23.3 mW; average power: 0.076 mW). Operation is completely harmless to humans and animals.

Observing the limit values specified in the "Technical data" and listed in the Operating Instructions and supplementary documentation, the measuring device may be used for the following measurements only:
- Measured process variables: level, distance, signal strength
- Calculated process variables: Volume or mass in arbitrarily shaped vessels; flow through measuring weirs or flumes (calculated from the level by the linearization functionality)

To ensure that the measuring device remains in proper condition for the operation time:
- Use the measuring device only for measured materials against which the process-wetted materials are adequately resistant.
- Observe the limit values in "Technical data".

**Incorrect use**
The manufacturer is not liable for damage caused by improper or non-designated use.

Verification for borderline cases:
- For special measured materials and cleaning agents, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of wetted materials, but does not accept any warranty or liability.

**Residual risk**
The electronics housing and its built-in components such as display module, main electronics module and I/O electronics module may heat to 80 °C (176 °F) during operation through heat transfer from the process as well as power dissipation within the electronics. During operation the sensor may assume a temperature near the temperature of the measured material.

Danger of burns due to heated surfaces!
- For high process temperatures: Install protection against contact in order to prevent burns.

## 2.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment according to federal/national regulations.

## 2.4 Operational safety

Risk of injury.
- Operate the device in proper technical condition and fail-safe condition only.
- The operator is responsible for interference-free operation of the device.

**Conversions to the device**

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.
- If, despite this, modifications are required, consult with the manufacturer.

**Repair**

To ensure continued operational safety and reliability,
- Carry out repairs on the device only if they are expressly permitted.
- Observe federal/national regulations pertaining to repair of an electrical device.
- Use original spare parts and accessories from the manufacturer only.

**Hazardous area**

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):
- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

## 2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. It meets general safety standards and legal requirements.

NOTICE

**Loss of degree of protection by opening of the device in humid environments**
- If the device is opened in a humid environment, the degree of protection indicated on the nameplate is no longer valid. This may also impair the safe operation of the device.

### 2.5.1 CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

### 2.5.2 EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity together with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

## 2.6 Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

| Feature 010 | Approval | Available for | Feature 020 "Power Supply; Output" | | | | |
|---|---|---|---|---|---|---|---|
| | | | A [1] | B [2] | C [3] | E [4]/G [5] | K [6]/L [7] |
| BA | ATEX: II 1 G Ex ia IIC T6-T1 Ga | FMR50 | XA00677F | XA00677F | XA00677F | XA00685F | - |
| BB | ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb | FMR50 | XA00677F | XA00677F | XA00677F | XA00685F | - |
| BC | ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb | FMR50 | XA00680F | XA00680F | XA00680F | XA00688F | XA00680F |
| BG | ATEX: II 3 G Ex nA IIC T6-T1 Gc | FMR50 | XA00679F | XA00679F | XA00679F | XA00687F | XA00679F |
| BH | ATEX: II 3 G Ex ic IIC T6-T1 Gc | FMR50 | XA00679F | XA00679F | XA00679F | XA00687F | XA00679F |
| B2 | ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb<br>ATEX: II 1/2 D Ex ia IIIC Txx°C Da/Db | FMR50 | XA00683F | XA00683F | XA00683F | XA00691F | - |
| B3 | ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb<br>ATEX: II 1/2 D Ex ta IIIC Txx°C Da/Db | FMR50 | XA00684F | XA00684F | XA00684F | XA00692F | XA00684F |
| B4 | ATEX:II 1/2 G Ex ia IIC T6-T1 Ga/Gb<br>ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb | FMR50 | XA00681F | XA00681F | XA00681F | XA00689F | - |
| CB | CSA C/US XP Cl.I Div.1 Gr.A-D | FMR50 | XA01112F | XA01112F | XA01112F | XA01114F | - |
| CC | CSA C/US XP Cl.I Div.1 Gr.A-D | FMR50 | XA01113F | XA01113F | XA01113F | XA01115F | XA01113F |
| C2 | CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div. 2, Ex ia | FMR50 | XA01112F | XA01112F | XA01112F | XA01114F | - |
| C3 | CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d | FMR50 | XA01113F | XA01113F | XA01113F | XA01115F | XA01113F |
| FA | FM IS Cl.I Div.1 Gr.A-D | FMR50 | XA01116F | XA01116F | XA01116F | XA01118F | - |
| FB | FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2 | FMR50 | XA01116F | XA01116F | XA01116F | XA01118F | - |
| FC | FM XP Cl.I Div.1 Gr.A-D | FMR50 | XA01117F | XA01117F | XA01117F | XA01119F | XA01117F |
| FD | FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2 | FMR50 | XA01117F | XA01117F | XA01117F | XA01119F | XA01117F |
| IA | IECEx: Ex ia IIC T6-T1 Ga | FMR50 | XA00677F | XA00677F | XA00677F | XA00685F | - |
| IB | IECEx: Ex ia IIC T6-T1 Ga/Gb | FMR50 | XA00677F | XA00677F | XA00677F | XA00685F | - |
| IC | IECEx: Ex d [ia] IIC T6-T1 Ga/Gb | FMR50 | XA00680F | XA00680F | XA00680F | XA00688F | XA00680F |
| IG | IECEx: Ex nA IIC T6-T1 Gc | FMR50 | XA00679F | XA00679F | XA00679F | XA00687F | XA00679F |
| IH | IECEx: Ex ic IIC T6-T1 Gc | FMR50 | XA00679F | XA00679F | XA00679F | XA00687F | XA00679F |
| I2 | IECEx: Ex ia IIC T6-T1 Ga/Gb<br>IECEx: Ex ia IIIC Txx°C Da/Db | FMR50 | XA00683F | XA00683F | XA00683F | XA00691F | - |
| I3 | IECEx: Ex d [ia] IIC T6-T1 Ga/Gb<br>IEXEx: Ex ta IIIC Txx°C Da/Db | FMR50 | XA00684F | XA00684F | XA00684F | XA00692F | XA00684F |
| I4 | IECEx: Ex ia IIC T6-T1 Ga/Gb<br>IECEx: Ex d [ia] IIC T6-T1 Ga/Gb | FMR50 | XA00681F | XA00681F | XA00681F | XA00689F | - |
| JI | JPN Ex ia IIC T6 Ga/Gb | FMR50 | XA01716F | XA01716F | - | - | - |
| JJ | JPN Ex [ia] IIC T6 Ga/Gb | FMR50 | XA01717F | XA01717F | - | - | - |

| Feature 010 | Approval | Available for | Feature 020 "Power Supply; Output" | | | | |
|---|---|---|---|---|---|---|---|
| | | | A [1] | B [2] | C [3] | E [4]/G [5] | K [6]/L [7] |
| KA | KC Ex ia IIC T6 Ga | FMR50 | XA01045F | XA01045F | XA01045F | XA01047F | - |
| KB | KC Ex ia IIC T6 Ga/Gb | FMR50 | XA01045F | XA01045F | XA01045F | XA01047F | - |
| KC | KC Ex d[ia] IIC T6 | FMR50 | XA01046F | XA01046F | XA01046F | XA01048F | XA01046F |
| MA | INMETRO: Ex ia IIC T6 Ga | FMR50 | XA01286F | XA01287F | XA01288F | XA01296F | - |
| MC | INMETRO: Ex d[ia] IIC T6 Ga/Gb | FMR50 | XA01292F | XA01292F | XA01293F | XA01298F | XA01294F |
| MH | INMETRO: Ex ic IIC T6 Gc | FMR50 | XA01289F | XA01290F | XA01291F | XA01297F | - |
| NA | NEPSI Ex ia IIC T6 Ga | FMR50 | XA01199F | XA01199F | XA01199F | XA01208F | - |
| NB | NEPSI Ex ia IIC T6 Ga/Gb | FMR50 | XA01199F | XA01199F | XA01199F | XA01208F | - |
| NC | NEPSI Ex d[ia] IIC T6 Ga/Gb | FMR50 | XA01202F | XA01202F | XA01202F | XA01211F | XA01202F |
| NG | NEPSI Ex nA II T6 Gc | FMR50 | XA01201F | XA01201F | XA01201F | XA01210F | XA01201F |
| NH | NEPSI Ex ic IIC T6 Gc | FMR50 | XA01201F | XA01201F | XA01201F | XA01210F | XA01201F |
| N2 | NEPSI Ex ia IIC T6 Ga/Gb, Ex iaD 20/21 T85... 90oC | FMR50 | XA01205F | XA01205F | XA01205F | XA01214F | - |
| N3 | NEPSI Ex d[ia] IIC T6 Ga/Gb, DIP A20/21 T85...90oC IP66 | FMR50 | XA01206F | XA01206F | XA01206F | XA01215F | XA01206F |
| 8A | FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G | FMR50 | ▪ XA01112F<br>▪ XA01113F<br>▪ XA01116F<br>▪ XA01117F | ▪ XA01112F<br>▪ XA01113F<br>▪ XA01116F<br>▪ XA01117F | ▪ XA01112F<br>▪ XA01113F<br>▪ XA01116F<br>▪ XA01117F | ▪ XA01114F<br>▪ XA01115F<br>▪ XA01118F<br>▪ XA01119F | - |

1) 2-wire; 4-20mA HART
2) 2-wire; 4-20mA HART, switch output
3) 2-wire; 4-20mA HART, 4-20mA
4) 2-wire; FOUNDATION Fieldbus, switch output
5) 2-wire; PROFIBUS PA, switch output
6) 4-wire 90-253VAC; 4-20mA HART
7) 4-wire 10.4-48VDC; 4-20mA HART

For certified devices the relevant Safety Instructions (XA) are indicated on the nameplate.

If the device is prepared for the remote display FHX50 (product structure: feature 030: Display, Operation", option L or M), the Ex marking of some certificates changes according to the following table [1]:

| Feature 010 ("Approval") | Feature 030 ("Display, Operation") | Ex marking |
|---|---|---|
| BG | L, M or N | ATEX II 3G Ex nA [ia Ga] IIC T6-T1 Gc |
| BH | L, M or N | ATEX II 3G Ex ic [ia Ga] IIC T6-T1 Gc |
| B3 | L, M or N | ATEX II 1/2G Ex d [ia] IIC T6-T1 Ga/Gb,<br>ATEX II 1/2D Ex ta [ia Db] IIIC Txx°C Da/Db |
| IG | L, M or N | IECEx Ex nA [ia Ga] IIC T6-T1 Gc |
| IH | L, M or N | IECEx Ex ic [ia Ga] IIC T6-T1 Gc |
| I3 | L, M or N | IECEx Ex d [ia] IIC T6-T1 Ga/Gb,<br>IECEx Ex ta [ia Db] IIIC Txx°C Da/Db |
| MH | L, M or N | Ex ic [ia Ga] IIC T6 Gc |
| NG | L, M or N | NEPSI Ex nA [ia Ga] IIC T6-T1 Gc |

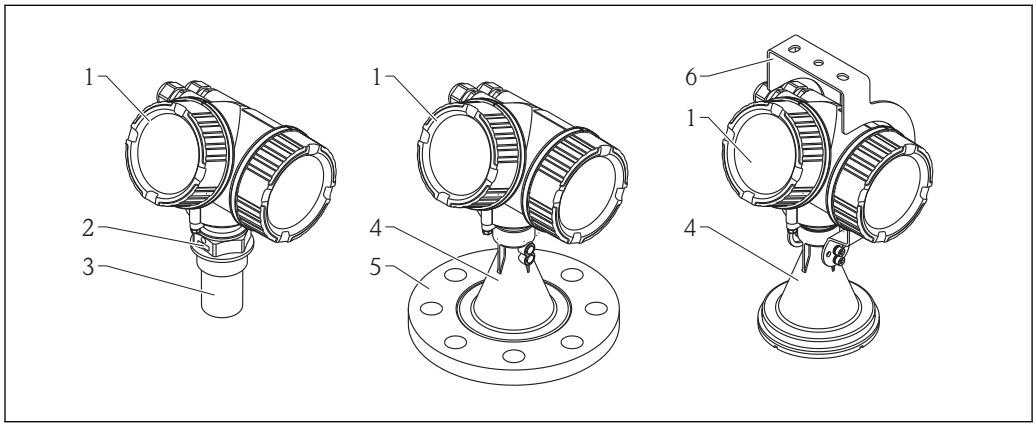
1) The marking of certificates not mentioned in this table are not affected by the FHX50.

| Feature 010 ("Approval") | Feature 030 ("Display, Operation") | Ex marking |
|---|---|---|
| NH | L, M or N | NEPSI Ex ic [ia Ga] IIC T6-T1 Gc |
| N3 | L, M or N | NEPSI Ex d [ia] IIC T6-T1 Ga/Gb, DIP A20/21 [ia D] TA, Txx°C IP6X |

# 3 Product description

## 3.1 Product design

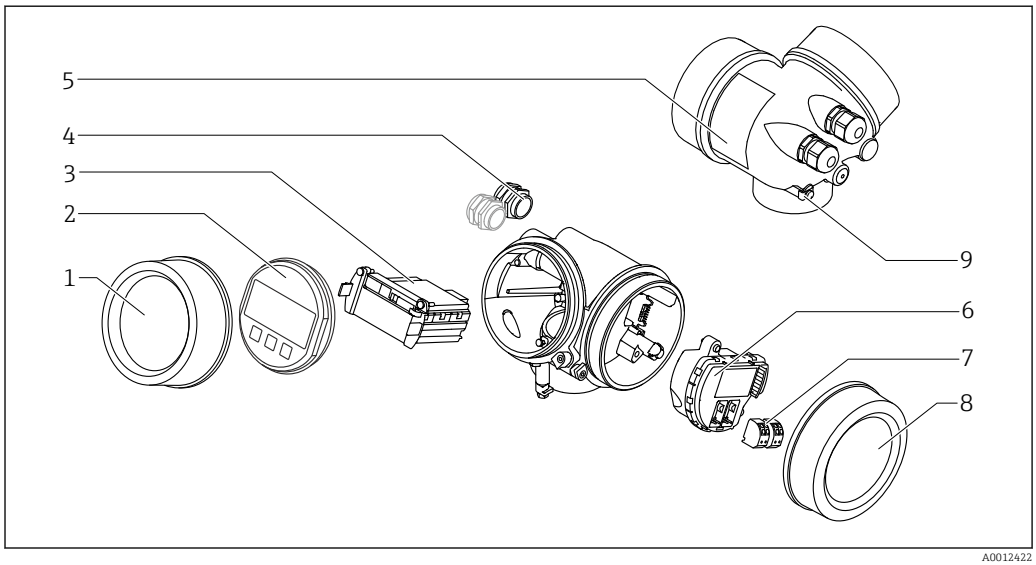
### 3.1.1 Micropilot FMR50




*1 Design of the Micropilot FMR50 (26 GHz)*

*1 Electronics housing*
*2 Process connection (Thread)*
*3 Horn antenna 40 mm (1-1/2 in), PVDF encapsulated*
*4 Horn antenna 80mm/100 mm (3in/4 in), PP cladded*
*5 Slip-on flange*
*6 Mounting bracket*

### 3.1.2 Electronics housing




*2 Design of the electronics housing*

*1 Electronics compartment cover*
*2 Display module*
*3 Main electronics module*
*4 Cable glands (1 or 2, depending on instrument version)*
*5 Nameplate*
*6 I/O electronics module*
*7 Terminals (pluggable spring terminals)*
*8 Connection compartment cover*
*9 Grounding terminal*

# 4 Incoming acceptance and product identification

## 4.1 Incoming acceptance

Upon receipt of the goods check the following:
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- Is the DVD with the operating tool present?
  If required (see nameplate): Are the Safety Instructions (XA) present?

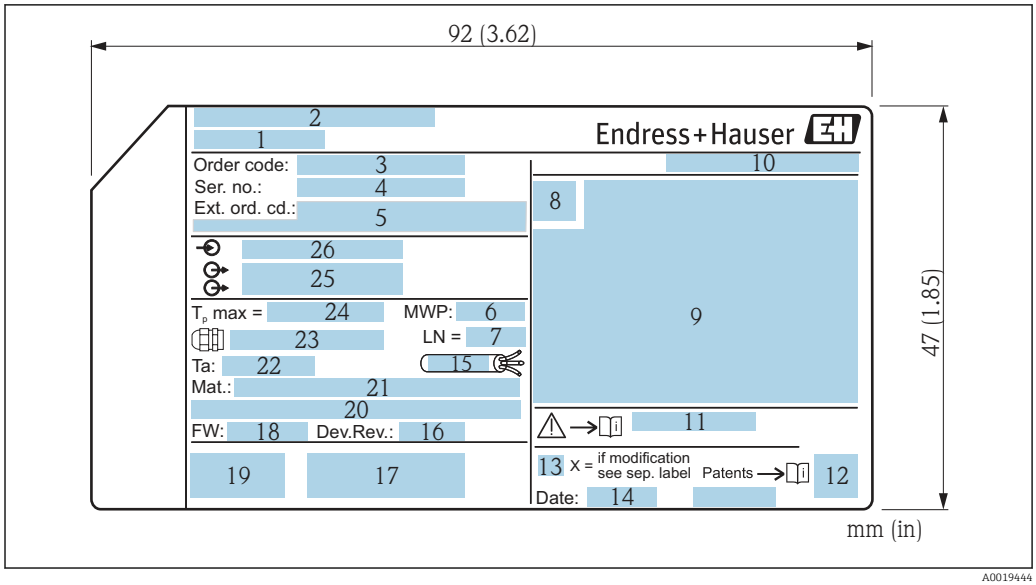
If one of these conditions is not satisfied, contact your Endress+Hauser Sales Center.

## 4.2 Product identification

The following options are available for identification of the measuring device:
- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* ( www.endress.com/deviceviewer ): All information about the measuring device is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information for the measuring device is displayed.

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

### 4.2.1 Nameplate




3 *Nameplate of the Micropilot*

1 *Device name*
2 *Address of manufacturer*
3 *Order code*
4 *Serial number (Ser. no.)*
5 *Extended order code (Ext. ord. cd.)*
6 *Process pressure*
7 *Antenna length (only for FMR51 with antenna extension)*
8 *Certificate symbol*
9 *Certificate and approval relevant data*
10 *Degree of protection: e.g. IP, NEMA*
11 *Document number of the Safety Instructions: e.g. XA, ZD, ZE*
12 *Data Matrix Code*
13 *Modification mark*
14 *Manufacturing date: year-month*
15 *Temperature resistance of the cable*
16 *Device revision*
17 *Additional information about the device version (certificates, approvals, communication): e.g. SIL, PROFIBUS*
18 *Firmware version (FW)*
19 *CE mark, C-Tick*
20 *Profibus PA: Profil-Version; FOUNDATION Fieldbus: Device ID*
21 *Material in contact with process*
22 *Permitted ambient temperature ($T_a$)*
23 *Size of the thread of the cable glands*
24 *Maximum process temperature*
25 *Signal outputs*
26 *Operating voltage*

Only 33 digits of the extended order code can be indicated on the nameplate. If the extended order code exceeds 33 digits, the rest will not be shown. However, the complete extended order code can be viewed in the operating menu of the device: **Extended order code 1 to 3** parameter

# 5 Storage, Transport

## 5.1 Storage conditions

- Permitted storage temperature: −40 to +80 °C (−40 to +176 °F)
- Use the original packaging.

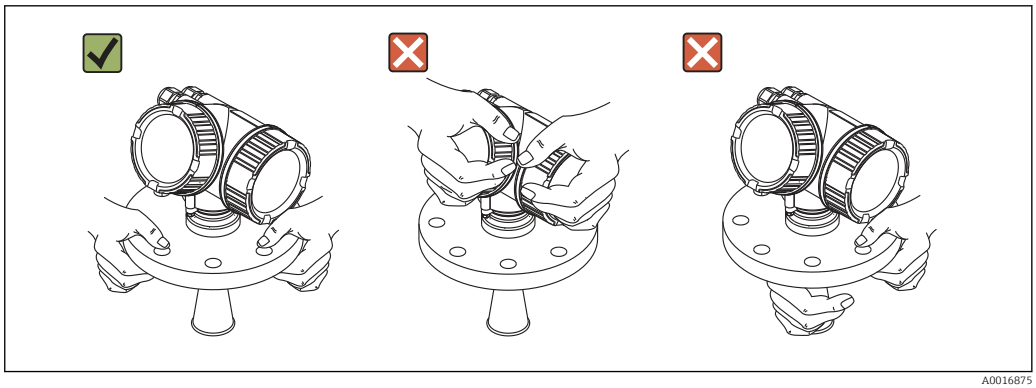
## 5.2 Transport product to the measuring point

NOTICE

**Housing or antenna horn may be damaged or break away.**

Risk of injury!

- ▶ Transport the measuring device to the measuring point in its original packaging or at the process connection.
- ▶ Do not fasten lifting devices (hoisting slings, lifting eyes etc.) at the housing or the antenna horn but at the process connection. Take into account the mass center of the device in order to avoid unintended tilting.
- ▶ Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs) (IEC61010).

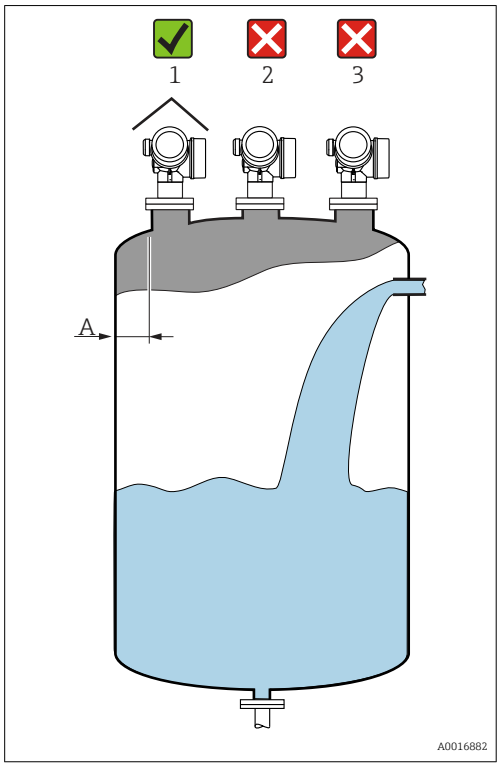


A0016875

# 6 Installation

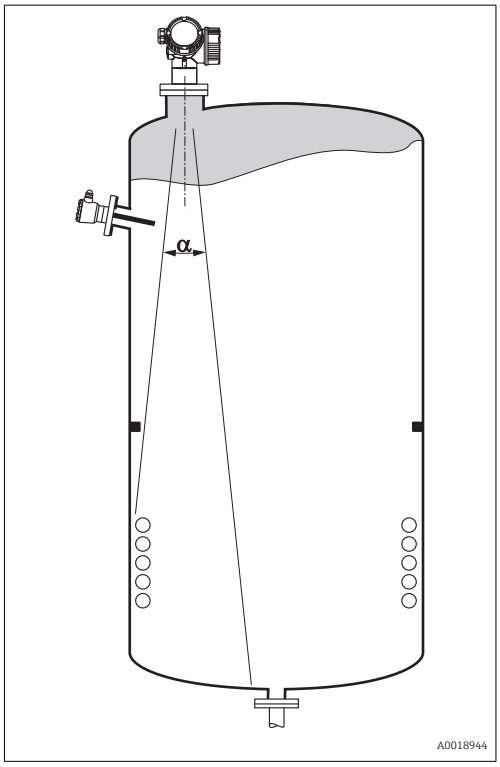
## 6.1 Installation conditions

### 6.1.1 Mounting position



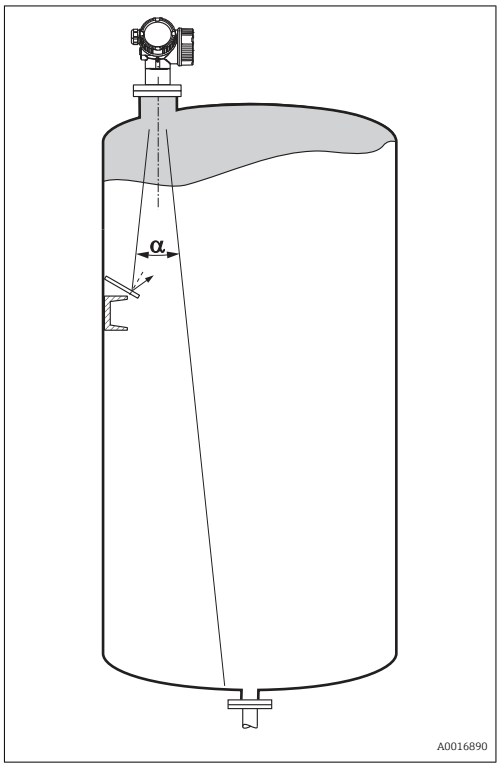

- Recommended distance **A** from wall to outer edge of nozzle: ~ 1/6 of tank diameter.
  Nevertheless the device should not be installed closer than 15 cm (5.91 in) to the tank wall.
- Not in the center (2), as interference can cause signal loss.
- Not above the fill stream (3).
- It is recommended to us a weather protection cover (1) in order to protect the device from direct sun or rain.

### 6.1.2 Vessel installations




Avoid any installations (point level switches, temperature sensors, braces, vacuum rings, heating coils, baffles etc.) inside the signal beam. Take into account the beam angle → 23.

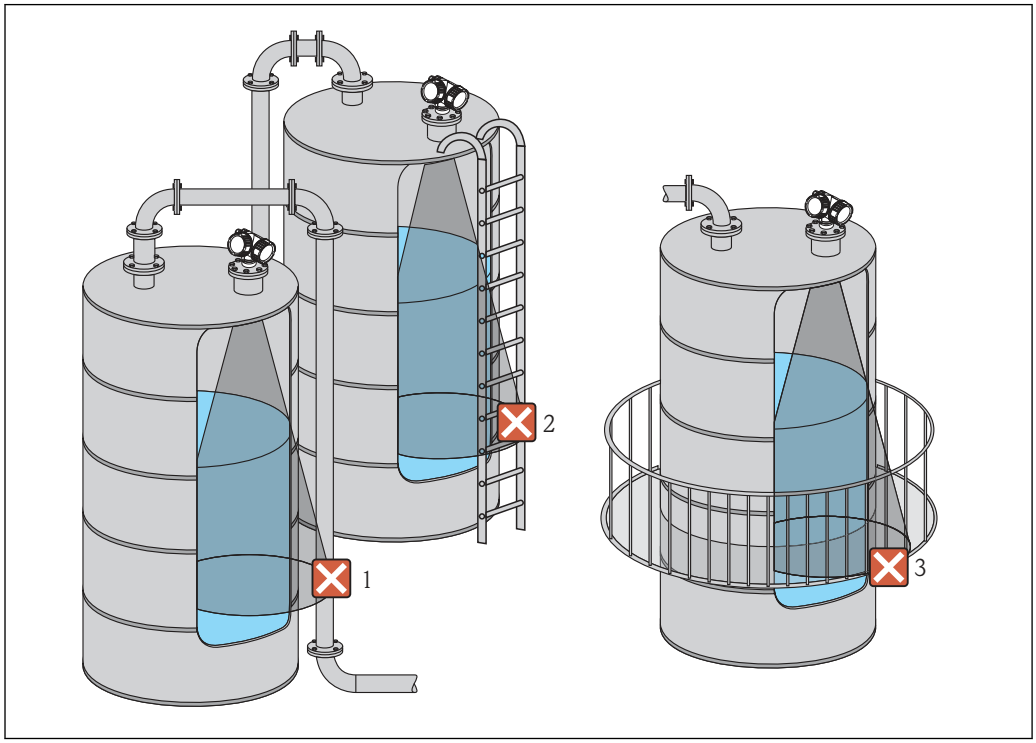
### 6.1.3 Reduction of interference echoes




Metallic screens mounted at a slope spread the radar signal and can, therefore, reduce interference echoes.

### 6.1.4 Measurement in a plastic vessel

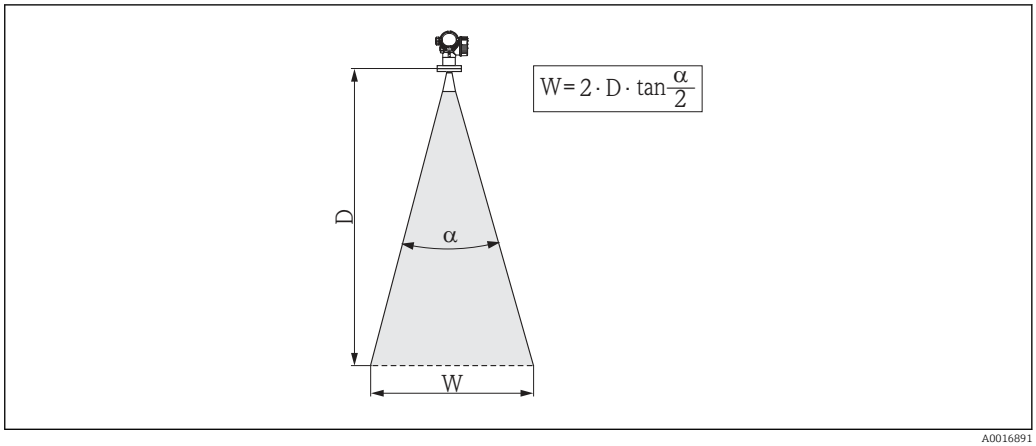
If the outer wall of the vessel is made of a non-conductive material (e.g. GRP), microwaves can also be reflected off interfering installations outside the vessel (e.g. metallic pipes (1), ladders (2), grates (3), ...). Therefore, there should be no such interfering installations in the signal beam. Please contact Endress+Hauser for further information.




### 6.1.5 Optimization options

- Antenna size
  The bigger the antenna, the smaller the beam angle α and the fewer interference echoes → 🖹 23.
- Mapping
  The measurement can be optimized by means of electronic suppression of interference echoes.
  See the **Confirm distance** parameter (→ 🖹 135) for details.
- Antenna alignment
  Take into account the marker on the flange or threaded connection → 🖹 25 → 🖹 26.
- Stilling well
  A stilling well can be applied to avoid interferences → 🖹 29.
- Metallic screens mounted at a slope
  They spread the radar signals and can, therefore, reduce interference echoes.

### 6.1.6 Beam angle




4 *Relationship between beam angle α, distance D and beamwidth diameter W*

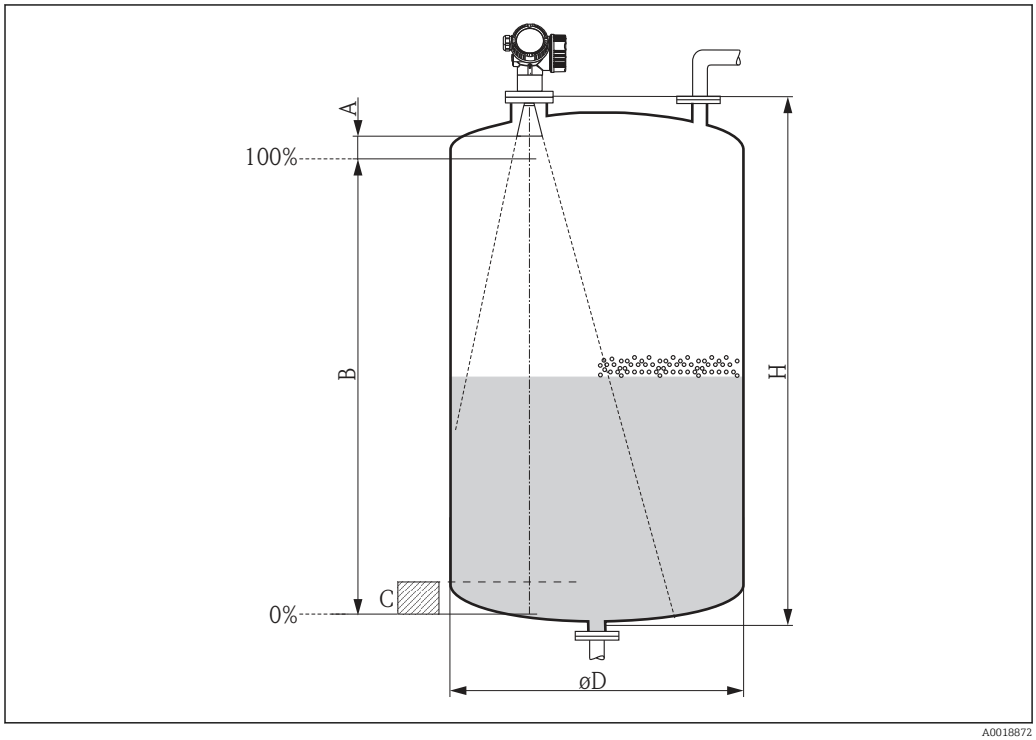
The beam angle is defined as the angle α where the energy density of the radar waves reaches half the value of the maximum energy density (3-dB-width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

Beam diameter **W** as a function of beam angle **α** and measuring distance **D**:

| **FMR50** | | | |
|---|---|---|---|
| **Antenna size** | 40 mm (1½ in) | 80 mm (3 in) | 100 mm (4 in) |
| **Beam angle α** | 23° | 10° | 8° |
| | | | |
| **Measuring distance (D)** | **Beamwidth diameter W** | | |
| 3 m (9.8 ft) | 1.22 m (4 ft) | 0.53 m (1.7 ft) | 0.42 m (1.4 ft) |
| 6 m (20 ft) | 2.44 m (8 ft) | 1.05 m (3.4 ft) | 0.84 m (2.8 ft) |
| 9 m (30 ft) | 3.66 m (12 ft) | 1.58 m (5.2 ft) | 1.26 m (4.1 ft) |
| 12 m (39 ft) | 4.88 m (16 ft) | 2.1 m (6.9 ft) | 1.68 m (5.5 ft) |
| 15 m (49 ft) | 6.1 m (20 ft) | 2.63 m (8.6 ft) | 2.10 m (6.9 ft) |
| 20 m (66 ft) | 8.14 m (27 ft) | 3.50 m (11 ft) | 2.80 m (9.2 ft) |
| 25 m (82 ft) | 10.17 m (33 ft) | 4.37 m (14 ft) | 3.50 m (11 ft) |
| 30 m (98 ft) | - | 5.25 m (17 ft) | 4.20 m (14 ft) |
| 35 m (115 ft) | - | 6.12 m (20 ft) | 4.89 m (16 ft) |
| 40 m (131 ft) | - | 7.00 m (23 ft) | 5.59 m (18 ft) |

## 6.2 Measuring conditions

- In case of **boiling surfaces**, **bubbling** or tendency for **foaming** use FMR53 or FMR54. Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions. For FMR50, FMR51 and FMR52, the additional option "Advanced dynamics" is recommended in these cases (feature 540: "Application Package", option EM).
- In case of heavy **steam development** or **condensate**, the maximum measuring range of FMR50, FMR51 and FMR52 may decrease depending on density, temperature and composition of the steam → use FMR53 or FMR54.
- For the measurement of absorbing gases such as **ammonia $NH_3$** or some **fluorocarbons** [2], please use Levelflex or Micropilot FMR54 in a stilling well.
- The measuring range begins, where the beam hits the tank bottom. Particularly with dish bottoms or conical outlets the level cannot be detected below this point.
- In stilling well applications, the electromagnetic waves do not propagate completely outside the tube. It must be taken into account that the accuracy may be reduced in the area **C**. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distance **C** above the end of the tube (see figure).
- In case of media with a low dielectric constant ($\varepsilon_r$ = 1.5 to 4) [3] the tank bottom can be visible through the medium at low levels (low height **C**). Reduced accuracy has to be expected in this range. If this is not acceptable, we recommend positioning the zero point at a distance **C** (see figure) above the tank bottom in these applications.
- In principle it is possible to measure up to the tip of the antenna with FMR51, FMR53 and FMR54. However, due to considerations regarding corrosion and build-up, the end of the measuring range should not be chosen any closer than **A** (see figure) to the tip of the antenna.
- When using FMR54 with planar antenna, especially for media with low dielectric constants, the end of the measuring range should not be closer than **A: 1 m (3.28 ft)** to the flange.
- The smallest possible measuring range **B** depends on the antenna version (see figure).
- The tank height should be at least **H** (see table).




A0018872

2) Affected compounds are e.g. R134a, R227, Dymel 152a.

3) Dielectric constants of important media commonly used in various industries are summarized in the DC manual (CP01076F) and in the Endress +Hauser "DC Values App" (available for Android and iOS).

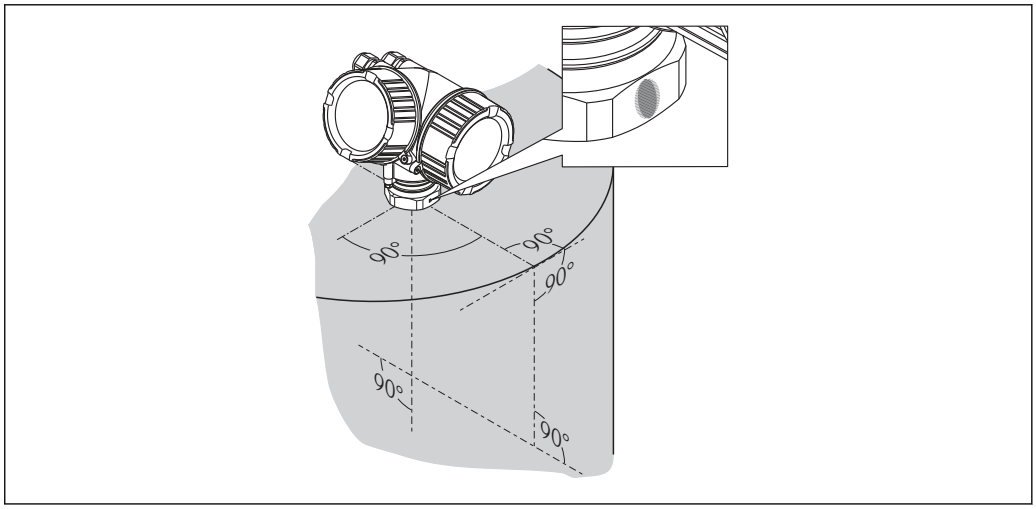
| Device | A [mm (in)] | B [m (ft)] | C [mm (in)] | H [m (ft)] |
|---|---|---|---|---|
| FMR50 | 150 ( 5.91) | > 0.2 (0.7) | 50 to 250 (1.97 to 9.84) | > 0.3 (1.0) |

## 6.3 Installation in vessel (free space)

### 6.3.1 Horn antenna encapsulated (FMR50)

#### Alignment

- Align the antenna vertically to the product surface.
- A marking at the threaded connection enables alignment of the antenna. This marking must be aligned towards the tank wall as well as possible.

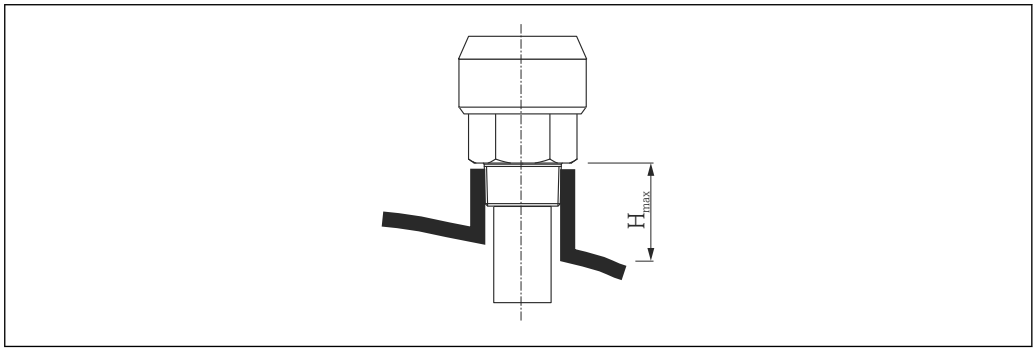



A0019434

Depending on the device version the marking may be a circle or two short parallel lines.

#### Nozzle mounting

For optimum measurement, the tip of the antenna should extend below the nozzle. This is achieved by a nozzle height up to $H_{max}$ = 60 mm (2.36 in).

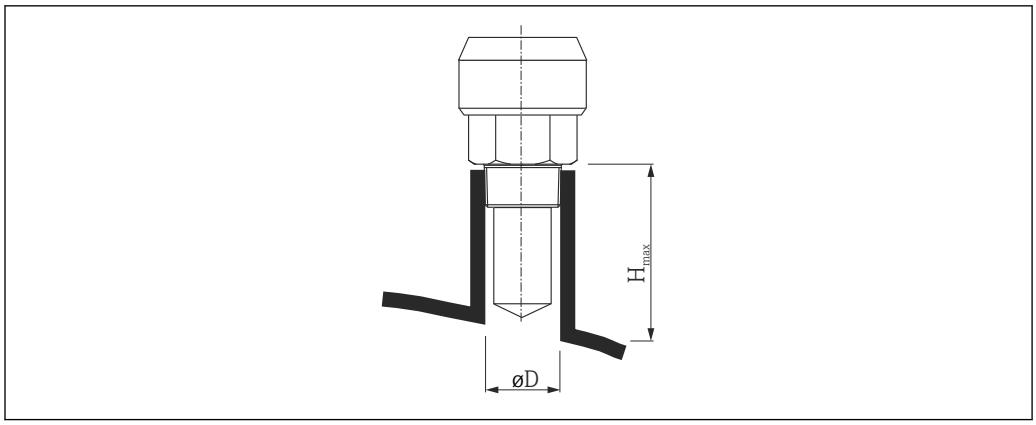



A0016806

5 *Nozzle height for horn antenna, encapsulated (FMR50); $H_{max}$ = 60 mm (2.36 in)*

#### Conditions for longer nozzles

If the medium has good reflective properties, higher nozzles can be accepted. In this case the maximum nozzle height, $H_{max}$, is dependent on the nozzle diameter, $D$:




A0023612

| Nozzle diameter $D$ | Maximum nozzle height $H_{max}$ |
|---|---|
| 40 mm (1.5 in) | 200 mm (7.9 in) |
| 50 mm (2 in) | 250 mm (9.9 in) |
| 80 mm (3 in) | 300 mm (11.8 in) |
| 100 mm (4 in) | 400 mm (15.8 in) |
| 150 mm (6 in) | 500 mm (19.7 in) |

If the antenna doesn't extend below the nozzle, observe the following:
- The nozzle end must be smooth and free of burrs. If possible its edge should be rounded.
- An interference echo suppression must be performed.
- Please contact Endress+Hauser for applications with higher nozzles than those indicated in the table.

### Threaded connection

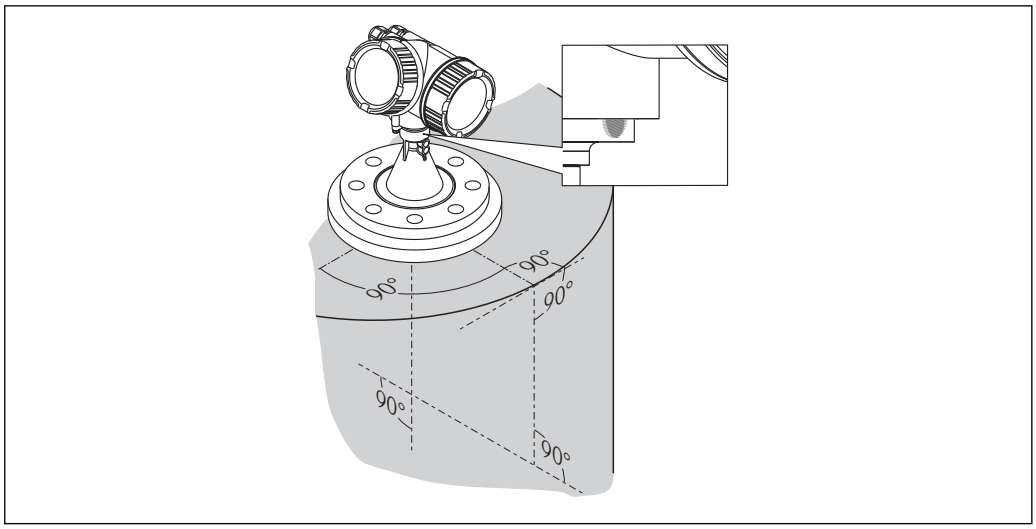
- Tighten with the hexagonal nut only.
- Tool : 50 mm hexagonal wrench
- Maximum permissible torque: 35 Nm (26 lbf ft)

## 6.3.2 Horn antenna with slip-on flange (FMR50)

### Alignment

When using the Micropilot with a slip-on flange in explosion-hazardous areas, strictly observe all specifications in the relevant Safety Instructions (XA).

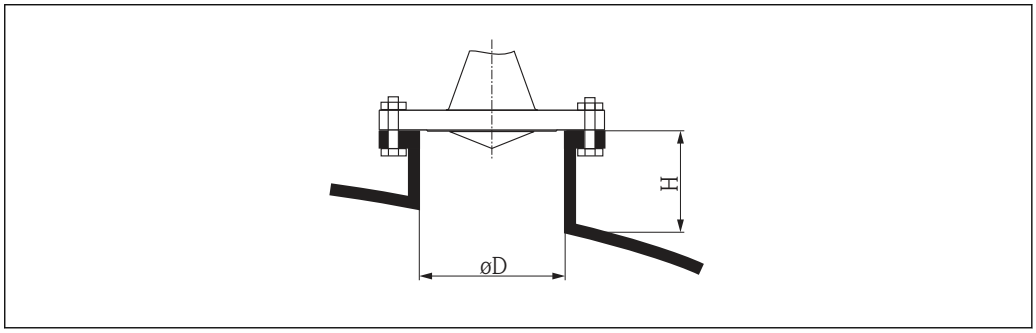
- Align the antenna vertically to the product surface.
  Optionally, a variable flange seal, which is available as an accessory, can be used for alignment (see Technical Information BA01048F, chapter "Accessories").
- A marking at the feedthrough enables alignment of the antenna. This marking must be aligned towards the tank wall as well as possible.




A0019439

Depending on the device version the marking may be a circle or two short parallel lines.

### Nozzle mounting

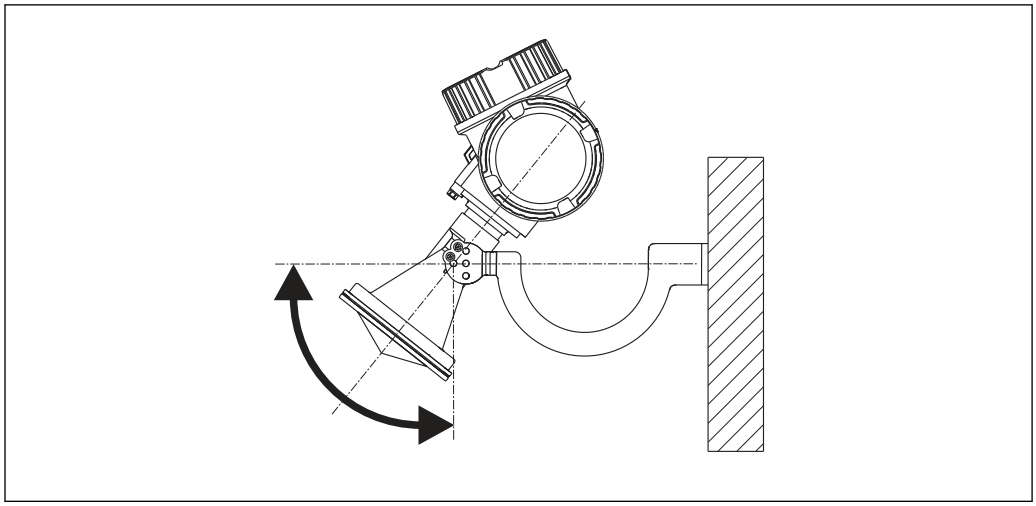



A0016868

6 *Nozzle height and diameter for horn antenna with slip-on flange*

| **Nozzle diameter** *D* | **Maximum nozzle height** $H_{max}$ |
|---|---|
| 80 mm (3 in) | 300 mm (11.8 in) |
| 100 mm (4 in) | 400 mm (15.8 in) |
| 150 mm (6 in) | 500 mm (19.7 in) |

### 6.3.3 Horn antenna with mounting bracket (FMR50)




7 *Installation of the horn antenna with mounting bracket*

Align the antenna vertically to the product surface using the mounting bracket.

NOTICE

**The mounting bracket has no conductive connection to the transmitter housing.**
Danger of electrostatic charge
► Connect the mounting bracket to the local potential equalization system.

### 6.3.4 Measurement from the outside through plastic walls (FMR50/ FMR51)

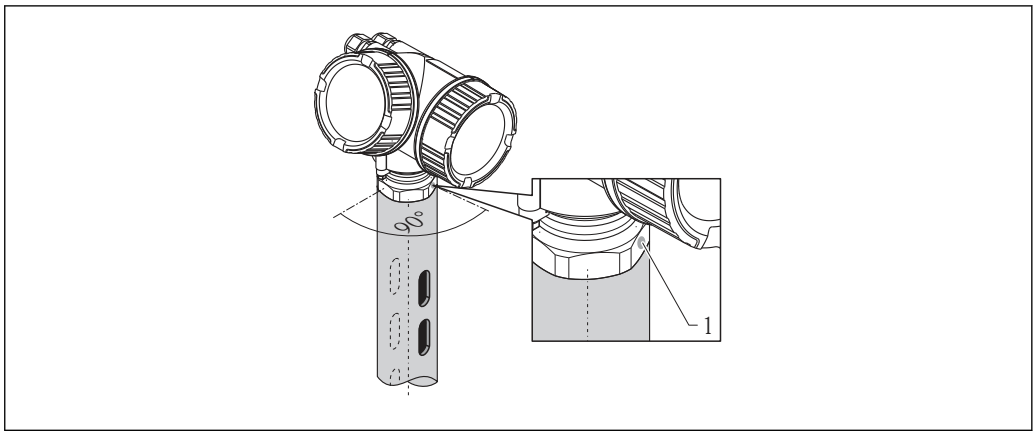
- Dielectric constant of the medium: $\varepsilon_r > 10$
- If possible, use an antenna 100 mm (4 in).
- The distance from the lower edge of the antenna to the tank ceiling should be about 100 mm (4 in).
- If possible, avoid mounting locations where condensation or build-up might occur.
- In case of outdoor mounting, the space between antenna and vessel has to be protected from the elements.
- Do not mount any potential reflectors (e.g. pipes) outside the tank in the signal beam.

*Suitable thickness of the tank ceiling:*

| Penetrated material | PE | PTFE | PP | Perspex |
|---|---|---|---|---|
| DK / $\varepsilon_r$ | 2.3 | 2.1 | 2.3 | 3.1 |
| Optimum thickness [1] | 3.8 mm (0.15 in) | 4.0 mm (0.16 in) | 3.8 mm (0.15 in) | 3.3 mm (0.13 in) |

1) Other possible values for the thickness are multiples of the values listed (e.g. for PE: 7,6 mm (0.3 in), 11,4 mm (0.45 in)

## 6.4 Installation in stilling well




*8 Installation in stilling well*

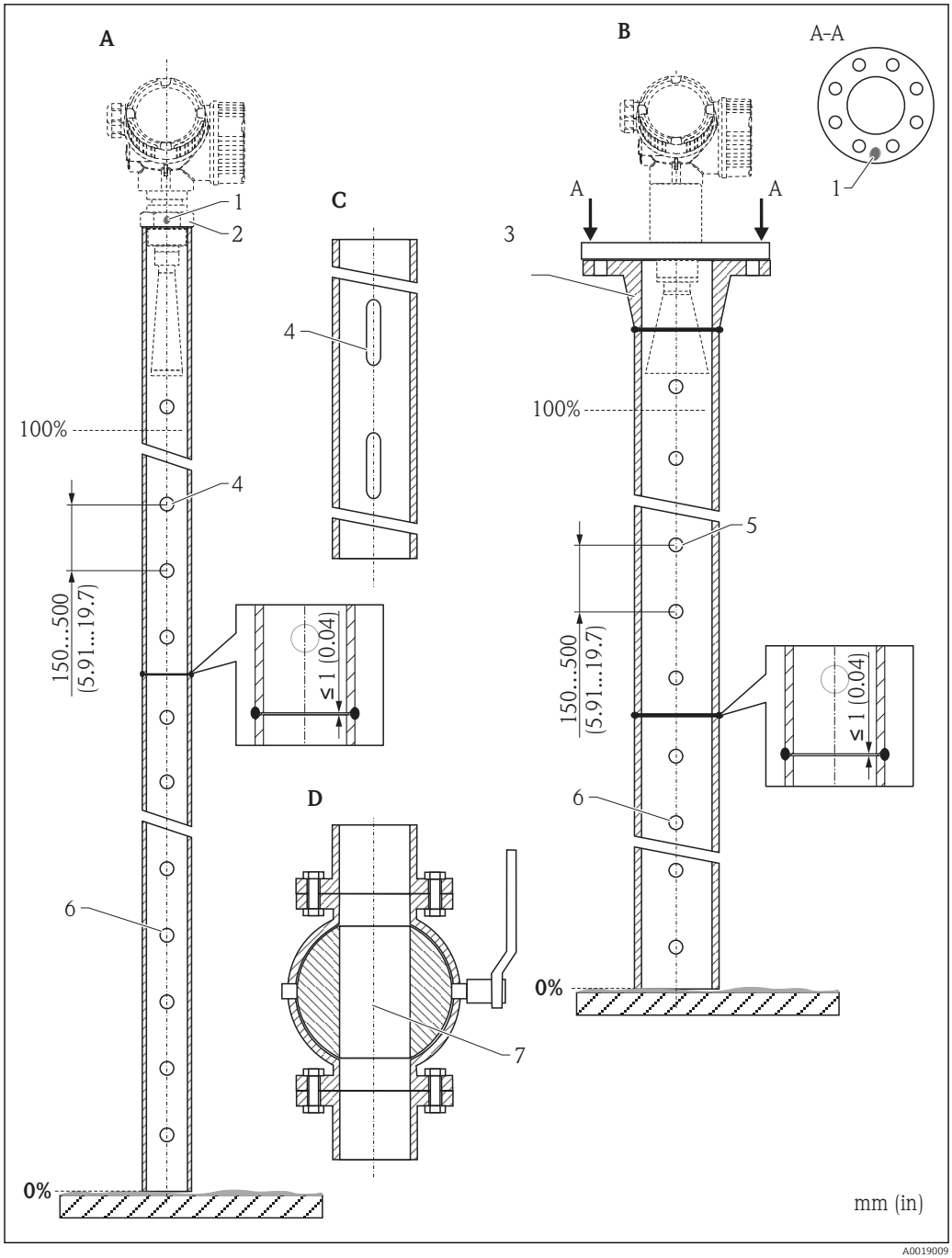
*1 Marking for antenna alignment*

- For horn antenna: Align the marking towards the slots of the stilling well.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to facilitate access to the display and the terminal compartment → 33.

### 6.4.1 Recommendations for the stilling well

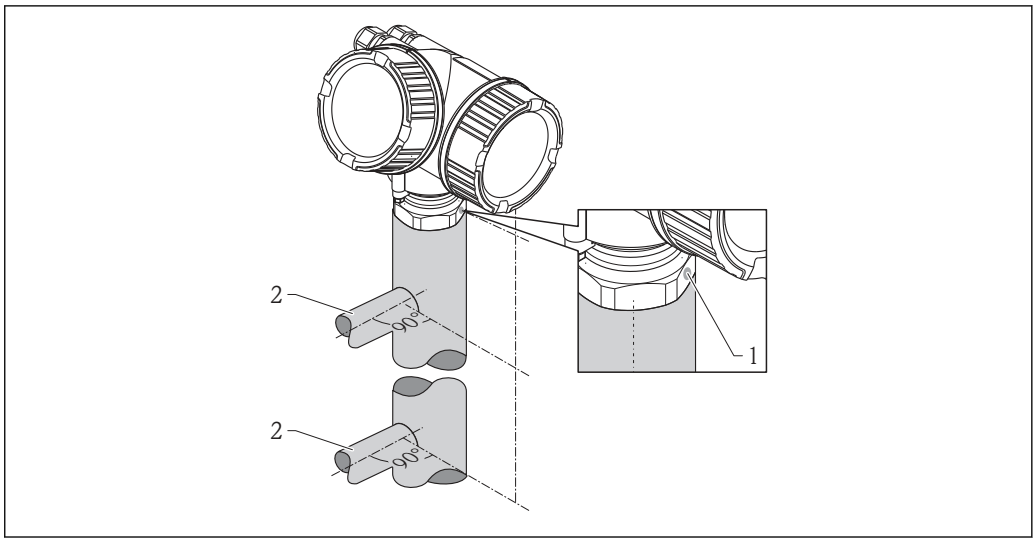
- Metal (no enamel coating; plastic on request).
- Constant diameter.
- Diameter of stilling well not larger than antenna diameter.
- Diameter difference between horn antenna and inner diameter of the stilling well as small as possible.
- Weld seam as smooth as possible and on the same axis as the slots.
- Slots offset 180° (not 90°).
- Slot width or diameter of holes max. 1/10 of pipe diameter, de-burred. Length and number do not have any influence on the measurement.
- Select horn antenna as big as possible. For intermedaite sizes (e.g. 180 mm (7 in)) select next larger antenna and adapt it mechanically (for horn antennas)
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be left exceeding 1 mm (0.04 in).
- The stilling well must be smooth on the inside (average roughness $R_z \leq$ 6.3 µm (248 µin)). Use extruded or parallel welded metal pipe. An extension of the pipe is possible with welded flanges or pipe sleeves. Flange and pipe have to be properly aligned at the inside.
- Do not weld through the pipe wall. The inside of the stilling well must remain smooth. In case of unintentional welding through the pipe, the weld seam and any unevenness on the inside need to be carefully removed and smoothened. Otherwise, strong interference echoes will be generated and material build-up will be promoted.
- In the case of smaller nominal widths flanges must be welded to the pipe such that they allow for a correct orientation (marker aligned toward slots).

## 6.4.2 Examples for the construction of stilling wells




*A Micropilot FMR50/FMR51: Horn 40mm(1½")*
*B Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")*
*C Stilling well with slots*
*D Full bore ball valve*
*1 Marking for axial alignment*
*2 Threaded connection*
*3 e.g. welding neck flange DIN2633*
*4 Φ hole max. 1/10 Φ stilling well*
*5 Φ hole max. 1/10 Φ stilling well; single sided or drilled through*
*6 Inside of holes deburred*
*7 Diameter of opening of ball valve must always be equivalent to pipe diameter; avoid edges and constrictions.*

## 6.5 Installation in bypass




9 *Installation in bypass*

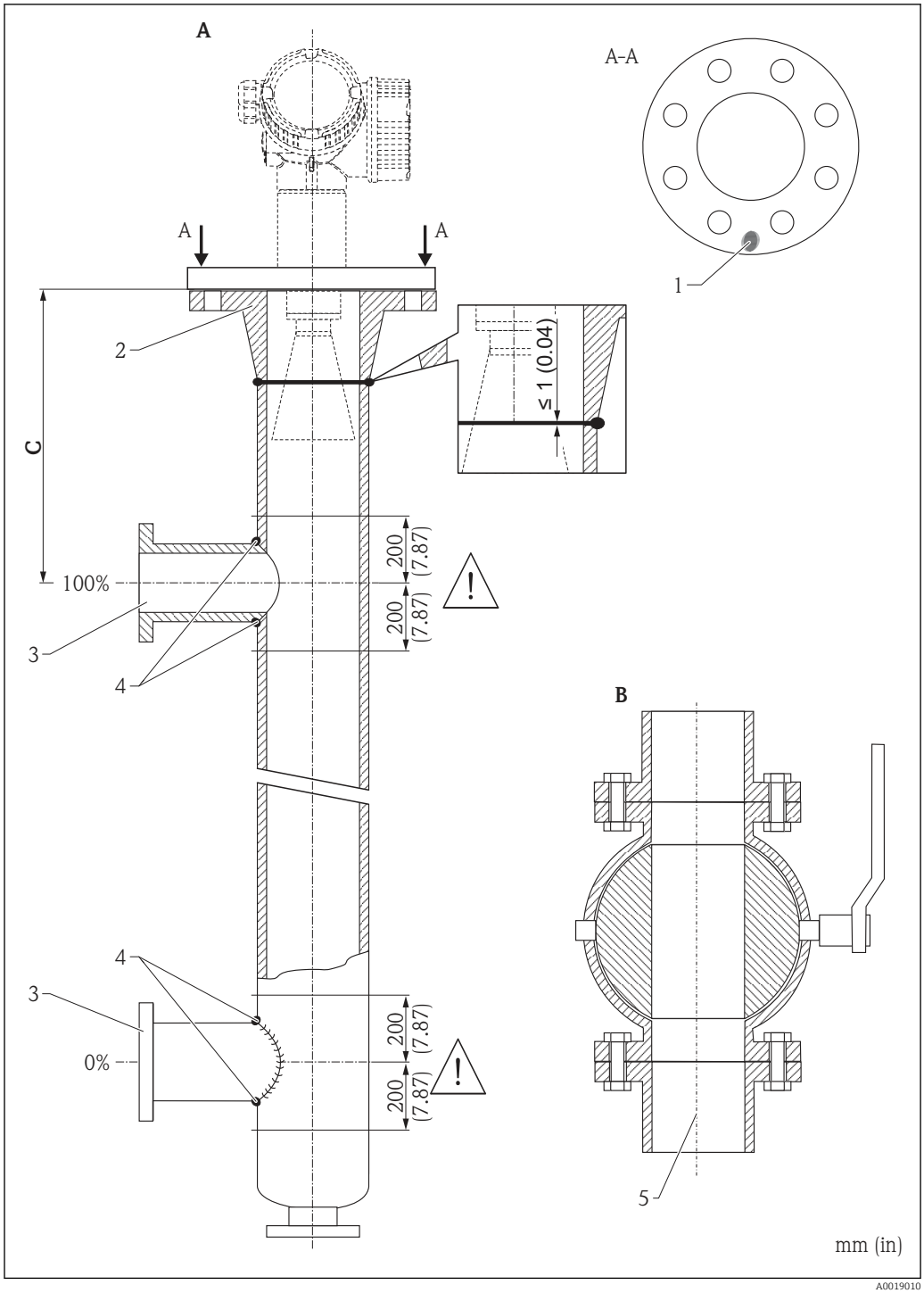
*1 Marking for antenna alignment*
*2 Tank connectors*

- Align the marker perpendicular (90°) to the tank connectors.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to facilitate access to the display and the terminal compartment → 33.

### 6.5.1 Recommendations for the bypass pipe

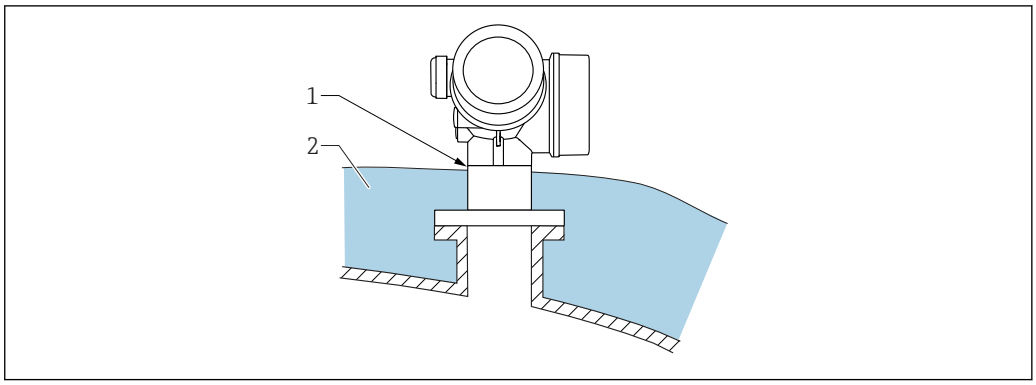
- Metal (no plastic or enamel coating).
- Constant diameter.
- Select horn antenna as big as possible. For intermediate sizes (e.g. 95 mm (3.5 in)) select next larger antenna and adapt it mechanically (for horn antennas).
- Diameter difference between horn antenna and inner diameter of the bypass as small as possible.
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04 in).
- In the area of the tank connections (~ ±20 cm (7.87 in)) a reduced accuracy of the measurement has to be expected.

### 6.5.2 Example for the construction of a bypass




*A Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")*
*B Full bore ball valve*
*C Minimum distance to upper connection pipe: 400 mm (15,7 in)*
*1 Marking for axial alignment*
*2 e.g. welding neck flange DIN2633*
*3 Diameter of the connection pipes as small as possible*
*4 Do not weld through the pipe wall; the inside of the bypass must remain smooth.*
*5 Diameter of opening of ball valve must always be equivalent to pipe diameter. Avoid edges and constrictions.*

## 6.6 Container with heat insulation

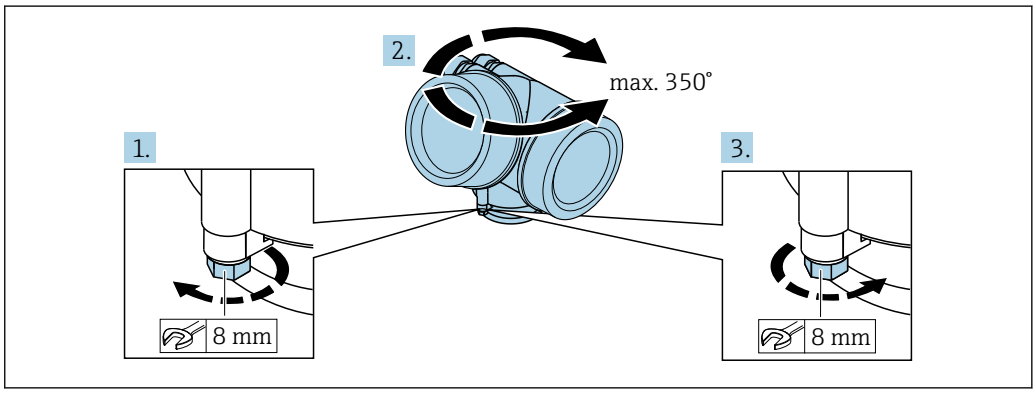



A0032207

If process temperatures are high, the device should be included in the usual container insulation system (2) to prevent the electronics from heating as a result of thermal radiation or convection. The insulation should not be higher than the neck of the device (1).

## 6.7 Turning the transmitter housing

To provide easier access to the connection compartment or display module, the transmitter housing can be turned:

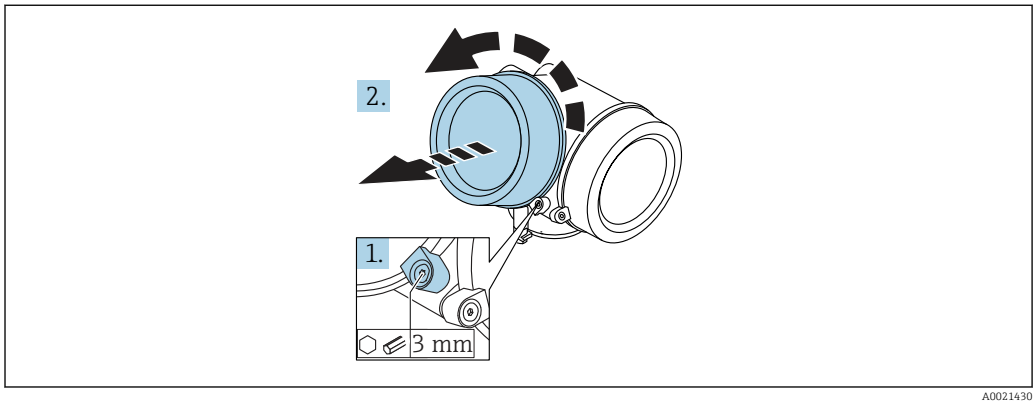



A0032242

1. Unscrew the securing screw using an open-ended wrench.
2. Rotate the housing in the desired direction.
3. Tighten the securing screw (1.5 Nm for plastic housing; 2.5 Nm for aluminum or stainless steel housing).

## 6.8 Turning the display

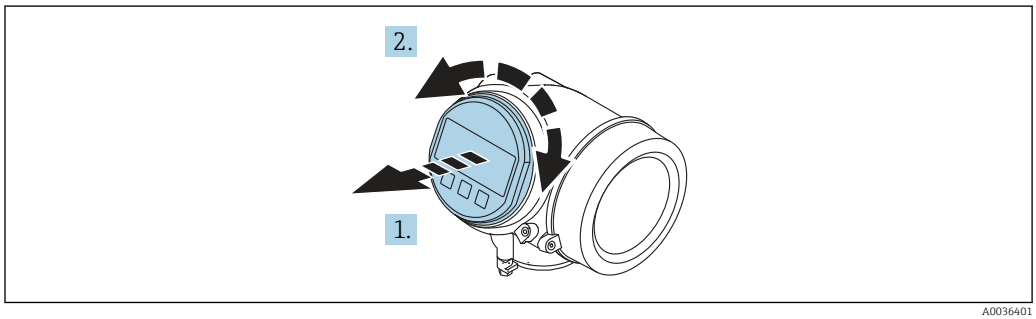
### 6.8.1 Opening cover




A0021430

1. Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key (3 mm) and turn the clamp 90 ° counterclockwise.
2. Unscrew cover and check lid gasket, replace if necessary.

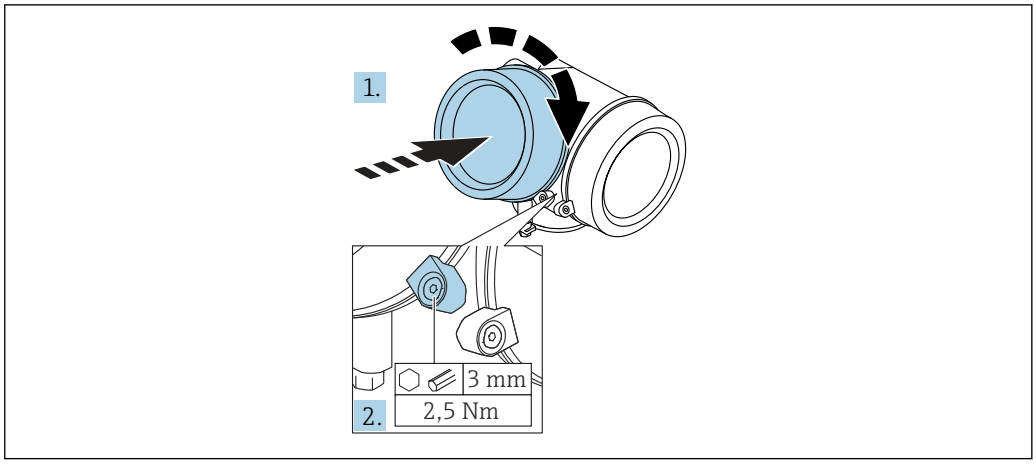
### 6.8.2 Turning the display module




A0036401

1. Pull out the display module with a gentle rotational movement.
2. Rotate the display module to the desired position: max. 8 × 45 ° in each direction.
3. Feed the coiled cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.

### 6.8.3 Closing electronics compartment cover




A0021451

1. Screw back firmly electronics compartment cover.
2. Turning securing clamp 90 ° clockwise and tighten the clamp with 2.5 Nm using the Allen key (3 mm).

## 6.9 Post-installation check

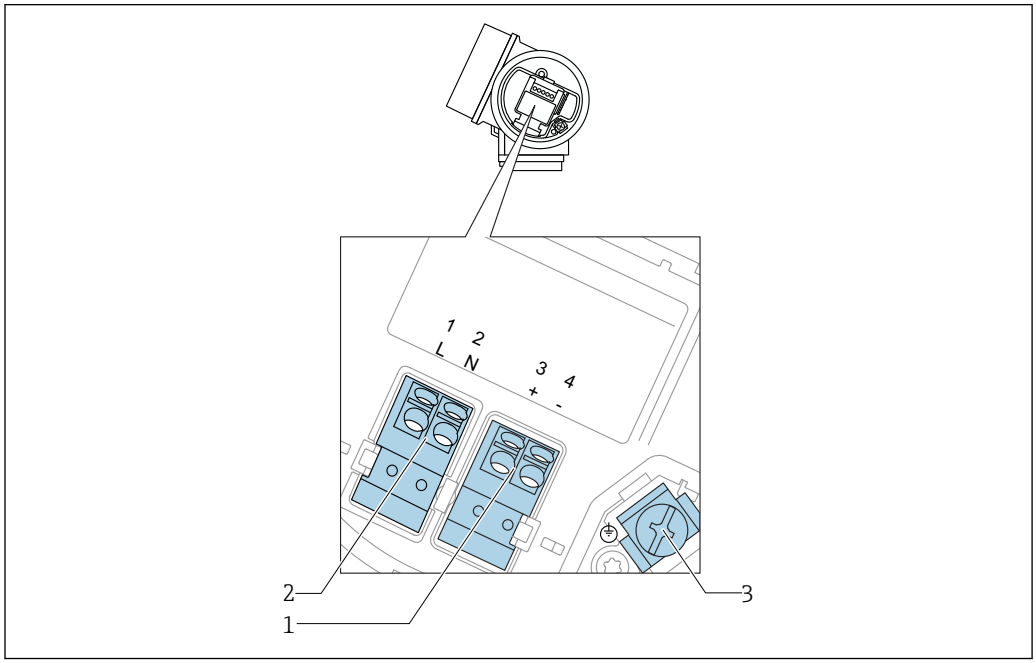
| | |
|---|---|
| ❑ | Is the device undamaged (visual inspection)? |
| ❑ | Does the device conform to the measuring point specifications?<br>For example:<br>▪ Process temperature<br>▪ Process pressure (refer to the chapter on "Material load curves" of the "Technical Information" document)<br>▪ Ambient temperature range<br>▪ Measuring range |
| ❑ | Are the measuring point identification and labeling correct (visual inspection)? |
| ❑ | Is the device adequately protected from precipitation and direct sunlight? |
| ❑ | Are the securing screw and securing clamp tightened securely? |

# 7 Electrical connection

## 7.1 Connection conditions

### 7.1.1 Terminal assignment

**Terminal assignment 4-wire: 4-20 mA HART (90 to 253 $V_{AC}$)**




10 *Terminal assignment 4-wire: 4-20 mA HART (90 to 253 $V_{AC}$)*

1 *Connection 4-20 mA HART (active): terminals 3 and 4*
2 *Connection supply voltage: terminals 1 and 2*
3 *Terminal for cable screen*

**CAUTION**

**To ensure electrical safety:**

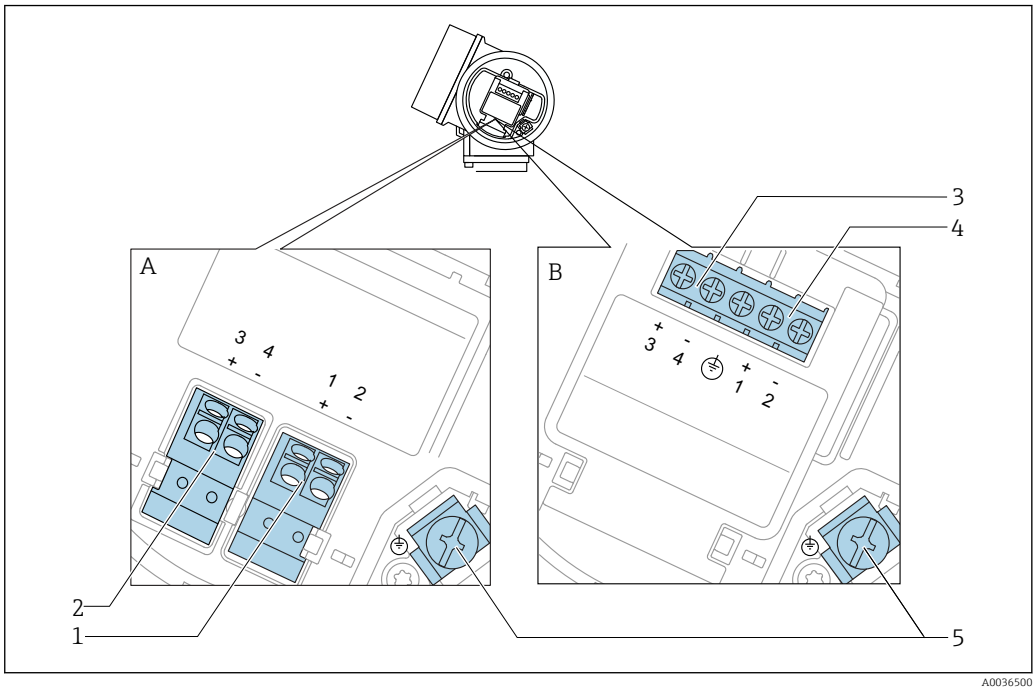
- ▶ Do not disconnect the protective connection.
- ▶ Disconnect the supply voltage before disconnecting the protective earth.

Connect protective earth to the internal ground terminal (3) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal.

In order to ensure electromagnetic compatibility (EMC): Do **not** only ground the device via the protective earth conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.

An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnector for the device (IEC/EN61010).

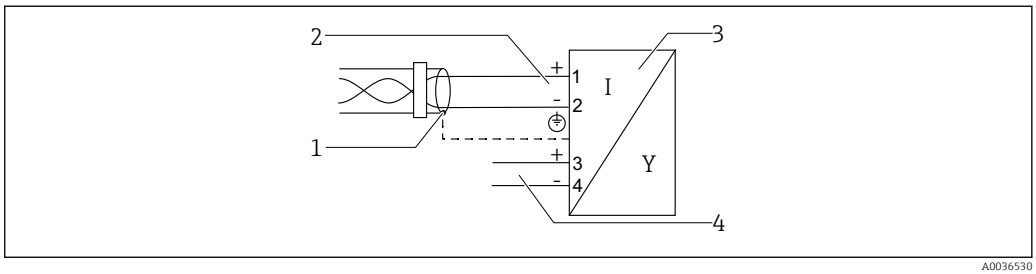
### Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus




11 *Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus*

*A Without integrated overvoltage protection*
*B With integrated overvoltage protection*
*1 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, without integrated overvoltage protection*
*2 Connection switch output (Open Collector): terminals 3 and 4, without integrated overvoltage protection*
*3 Connection switch output (Open Collector): terminals 3 and 4, with integrated overvoltage protection*
*4 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, with integrated overvoltage protection*
*5 Terminal for cable screen*

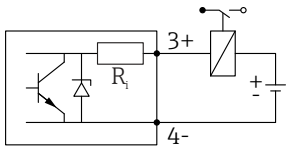
### Block diagram PROFIBUS PA / FOUNDATION Fieldbus




12 *Block diagram PROFIBUS PA / FOUNDATION Fieldbus*

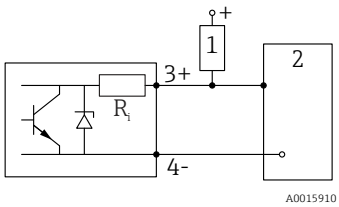
*1 Cable screen; observe cable specifications*
*2 Connection PROFIBUS PA / FOUNDATION Fieldbus*
*3 Measuring device*
*4 Switch output (open collector)*

**Connection examples for the switch output**




13 *Connection of a relay*

Suitable relays (examples):
- Solid-state relay: Phoenix Contact OV-24DC/480AC/5 with mounting rail connector UMK-1 OM-R/AMS
- Electromechanical relay: Phoenix Contact PLC-RSC-12DC/21




14 *Connection of a digital input*

*1 Pull-up resistor*
*2 Digital input*

For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or Pull-up resistor) of < 1 000 Ω.

## 7.1.2 Cable specification

- **Devices without integrated overvoltage protection**
  Pluggable spring-force terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- **Devices with integrated overvoltage protection**
  Screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)
- For ambient temperature $T_U \geq 60$ °C (140 °F): use cable for temperature $T_U$ +20 K.

**FOUNDATION Fieldbus**

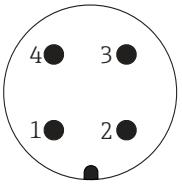
Endress+Hauser recommends using twisted, shielded two-wire cables.

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

### 7.1.3 Device plug connectors

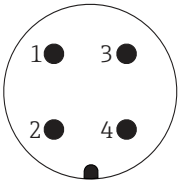
For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

*Pin assignment of the M12 plug connector*




| Pin | Meaning |
|---|---|
| 1 | Signal + |
| 2 | not connected |
| 3 | Signal - |
| 4 | Ground |

*Pin assignment of the 7/8" plug connector*




| Pin | Meaning |
|---|---|
| 1 | Signal - |
| 2 | Signal + |
| 3 | Not connected |
| 4 | Screen |

## 7.1.4 Supply voltage

### PROFIBUS PA, FOUNDATION Fieldbus

| "Power supply; Output" [1] | "Approval" [2] | Terminal voltage |
|---|---|---|
| **E:** 2-wire; FOUNDATION Fieldbus, switch output<br>**G:** 2-wire; PROFIBUS PA, switch output | ▪ Non-Ex<br>▪ Ex nA<br>▪ Ex nA(ia)<br>▪ Ex ic<br>▪ Ex ic(ia)<br>▪ Ex d(ia) / XP<br>▪ Ex ta / DIP<br>▪ CSA GP | 9 to 32 V [3] |
| | ▪ Ex ia / IS<br>▪ Ex ia + Ex d(ia) / IS + XP | 9 to 30 V [3] |

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) Input voltages up to 35 V will not spoil the device.

| | |
|---|---|
| **Polarity sensitive** | No |
| **FISCO/FNICO compliant according to IEC 60079-27** | Yes |

## 7.1.5 Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 µs), an overvoltage protection module has to be installed.

### Integrated overvoltage protection module

An integrated overvoltage protection module is available for 2-wire HART as well as PROFIBUS PA and FOUNDATION Fieldbus devices.

Product structure: Feature 610 "Accessory mounted", option NA "Overvoltage protection".

| Technical data | |
|---|---|
| Resistance per channel | 2 × 0.5 Ω max. |
| Threshold DC voltage | 400 to 700 V |
| Threshold impulse voltage | < 800 V |
| Capacitance at 1 MHz | < 1.5 pF |
| Nominal arrest impulse voltage (8/20 µs) | 10 kA |

### External overvoltage protection module

HAW562 or HAW569 from Endress+Hauser are suited as external overvoltage protection.

## 7.2 Connecting the measuring device

**⚠ WARNING**

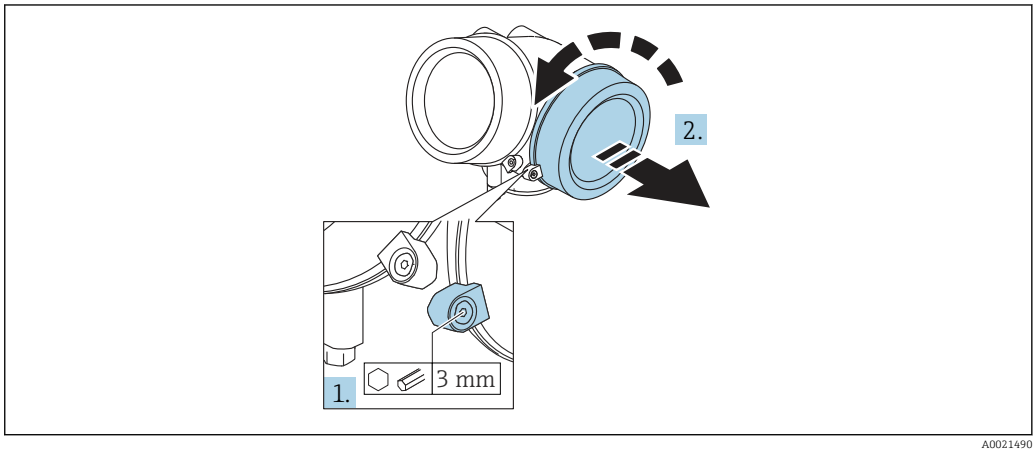
**Risk of explosion!**

- Observe applicable national standards.
- Comply with the specifications in the Safety Instructions (XA).
- Use specified cable glands only.
- Check to ensure that the power supply matches the information on the nameplate.
- Switch off the power supply before connecting the device.
- Connect the potential matching line to the outer ground terminal before applying the power supply.

**Required tools/accessories:**

- For devices with a cover lock: Allen key AF3
- Wire stripper
- When using stranded cables: One ferrule for every wire to be connected.

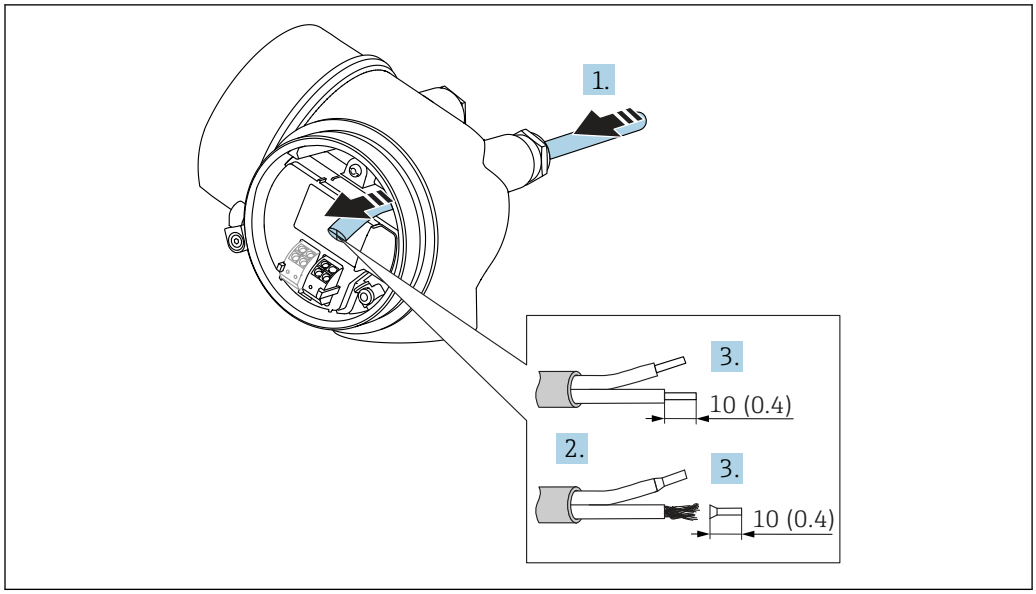
### 7.2.1 Opening connection compartment cover




A0021490

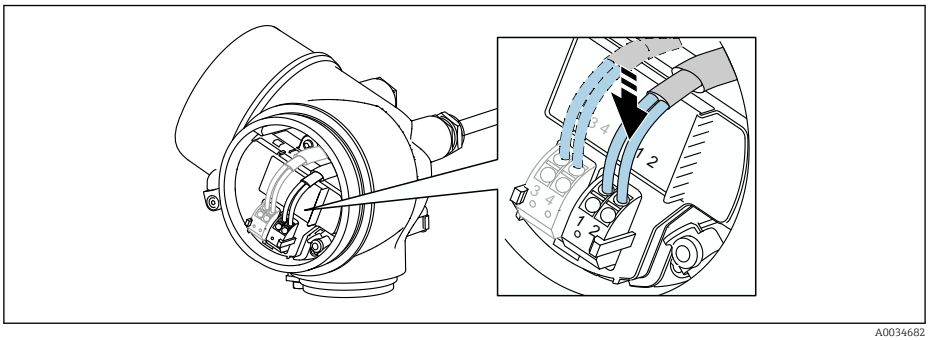
1. Loosen the screw of the securing clamp of the connection compartment cover using an Allen key (3 mm) and turn the clamp 90 ° clockwise.
2. Afterwards unscrew connection compartment cover and check lid gasket, replace if necessary.

### 7.2.2 Connecting




15 *Dimensions: mm (in)*

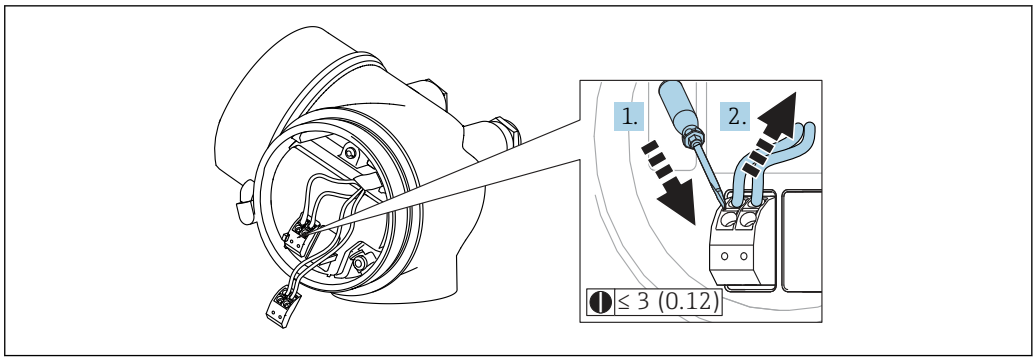
1. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
2. Remove the cable sheath.
3. Strip the cable ends over a length of 10 mm (0.4 in). In the case of stranded cables, also fit ferrules.
4. Firmly tighten the cable glands.
5. Connect the cable in accordance with the terminal assignment.




6. If using shielded cables: Connect the cable shield to the ground terminal.

### 7.2.3 Plug-in spring-force terminals

In the case of devices without integrated overvoltage protection, electrical connection is via plug-in spring-force terminals. Rigid conductors or flexible conductors with ferrules can be inserted directly into the terminal without using the lever, and create a contact automatically.

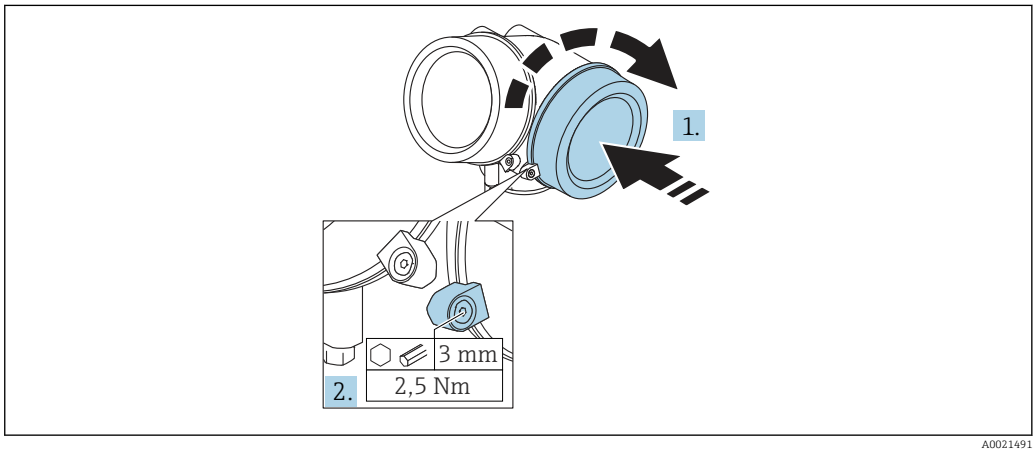



16 *Dimensions: mm (in)*

To remove cables from the terminal:

1. Using a flat-blade screwdriver ≤ 3 mm, press down on the slot between the two terminal holes
2. while simultaneously pulling the cable end out of the terminal.

### 7.2.4 Closing connection compartment cover




1. Screw back firmly connection compartment cover.
2. Turning securing clamp 90 ° counterclockwise and tighten the clamp with 2.5 Nm (1.84 lbf ft) again using the Allen key (3 mm).

## 7.3 Post-connection check

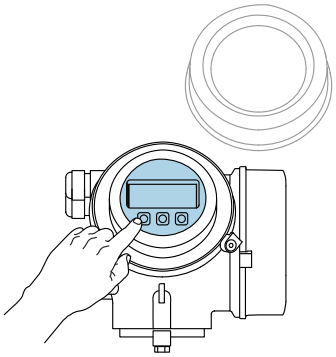
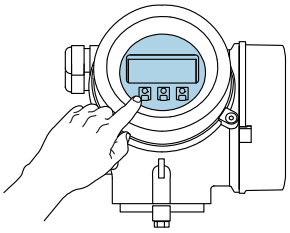
| | |
|---|---|
| ❑ | Is the device or cable undamaged (visual check)? |
| ❑ | Do the cables comply with the requirements ? |
| ❑ | Do the cables have adequate strain relief? |
| ❑ | Are all cable glands installed, securely tightened and leak-tight? |
| ❑ | Does the supply voltage match the specifications on the nameplate? |
| ❑ | Is the terminal assignment correct? |

| | |
|---|---|
| ❑ | If required: Has protective ground connection been established ? |
| ❑ | If supply voltage is present, is the device ready for operation and do values appear on the display module? |
| ❑ | Are all housing covers installed and securely tightened? |
| ❑ | Is the securing clamp tightened correctly? |

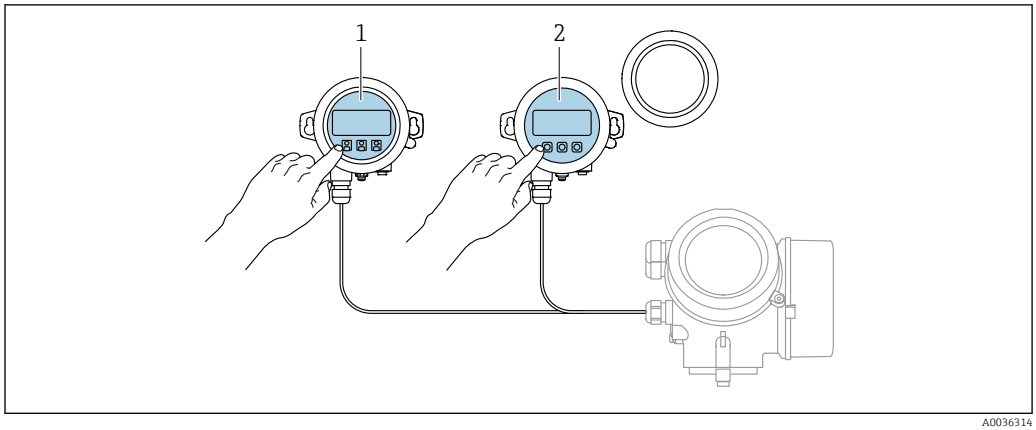
# 8 Operation options

## 8.1 Overview

### 8.1.1 Local operation

| | | |
|---|---|---|
| **Operation with** | *Pushbuttons* | *Touch Control* |
| **Order code for "Display; Operation"** | Option **C** "SD02" | Option **E** "SD03" |
| |  A0036312 |  A0036313 |
| **Display elements** | 4-line display | 4-line display<br>white background lighting; switches to red in event of device error |
| | Format for displaying measured variables and status variables can be individually configured | |
| | Permitted ambient temperature for the display: –20 to +70 °C (–4 to +158 °F)<br>The readability of the display may be impaired at temperatures outside the temperature range. | |
| **Operating elements** | local operation with 3 push buttons (⊞, ⊟, Ⓔ) | external operation via touch control; 3 optical keys: ⊞, ⊟, Ⓔ |
| | Operating elements also accessible in various hazardous areas | |
| **Additional functionality** | Data backup function<br>The device configuration can be saved in the display module. | |
| | Data comparison function<br>The device configuration saved in the display module can be compared to the current device configuration. | |
| | Data transfer function<br>The transmitter configuration can be transmitted to another device using the display module. | |

### 8.1.2 Operation with remote display and operating module FHX50

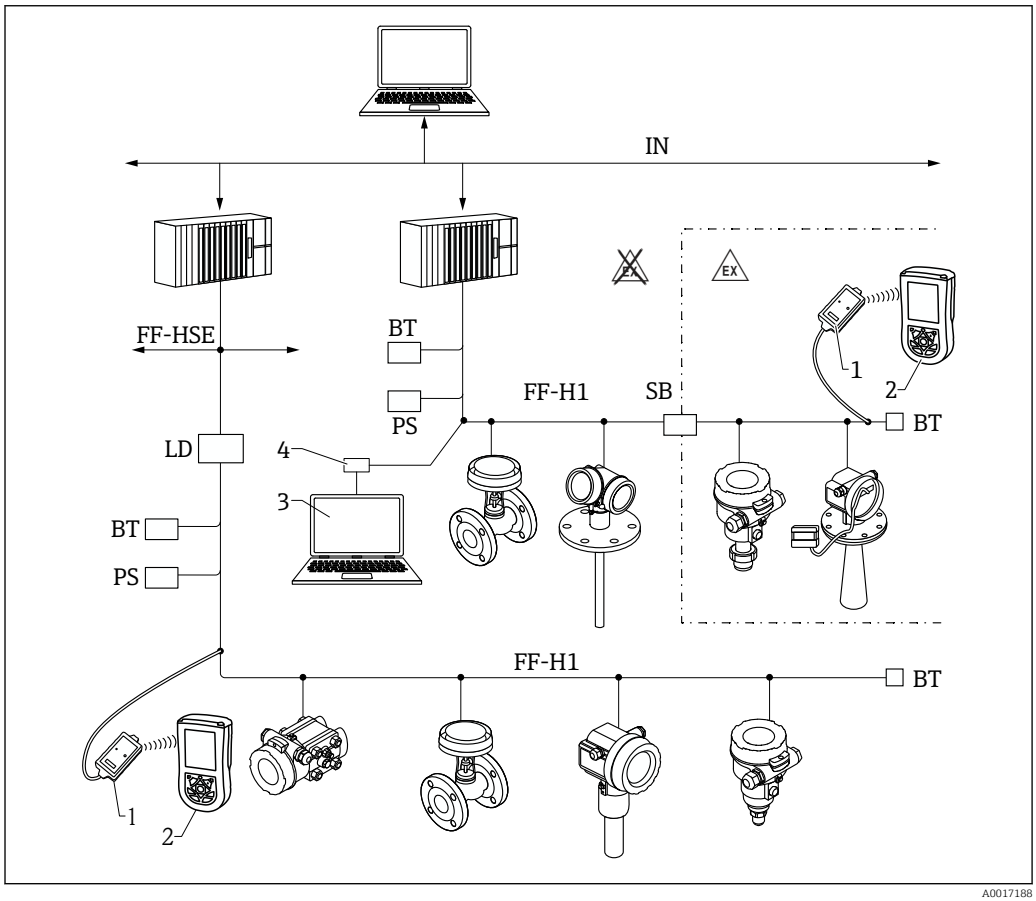



17 *FHX50 operating options*

1 *Display and operating module SD03, optical keys; can be operated through the glass of the cover*
2 *Display and operating module SD02, push buttons; cover must be removed*

### 8.1.3 Remote operation

#### Via FOUNDATION Fieldbus

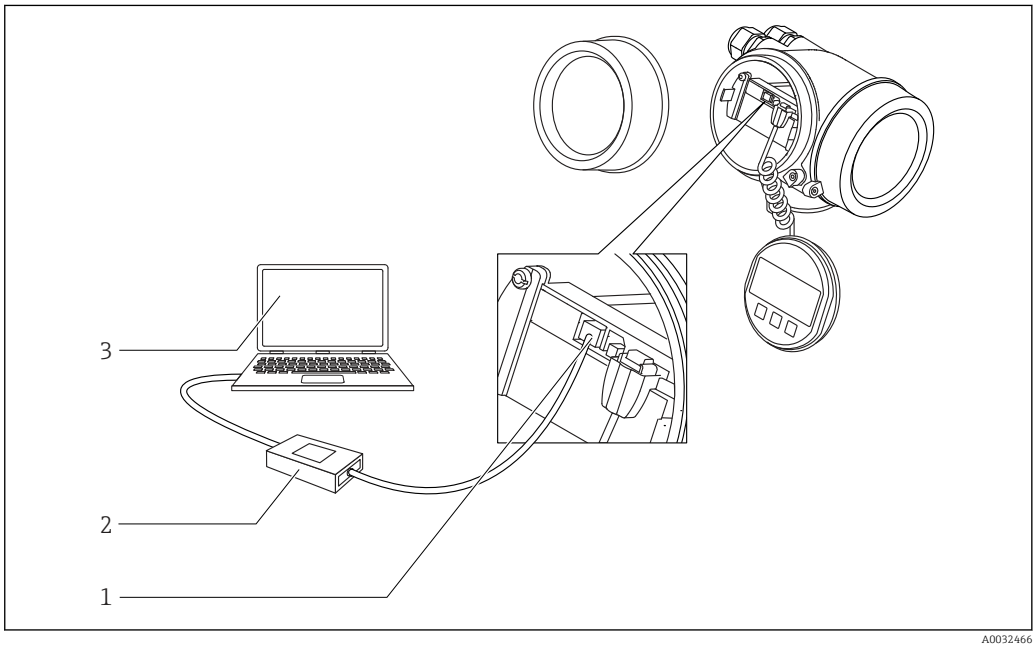



18 *FOUNDATION Fieldbus system architecture with associated components*

1 *FFblue Bluetooth modem*
2 *Field Xpert SFX350/SFX370*
3 *DeviceCare/FieldCare*
4 *NI-FF interface card*

| | |
|---|---|
| IN | Industrial network |
| FF-HSE | High Speed Ethernet |
| FF-H1 | FOUNDATION Fieldbus-H1 |
| LD | Linking Device FF-HSE/FF-H1 |
| PS | Bus Power Supply |
| SB | Safety Barrier |
| BT | Bus Terminator |

### DeviceCare/FieldCare via service interface (CDI)




*19 DeviceCare/FieldCare via service interface (CDI)*

*1 Service interface (CDI) of the instrument (= Endress+Hauser Common Data Interface)*
*2 Commubox FXA291*
*3 Computer with DeviceCare/FieldCare operating tool*

# 8.2 Structure and function of the operating menu

## 8.2.1 Structure of the operating menu

| Menu | Submenu / parameter | Meaning |
|---|---|---|
| | Language [1] | Defines the operating language of the on-site display |
| **Commissioning** [2] | | Launches the interactive wizard for guided commissioning.<br>Additional settings generally do not need to be made in the other menus when the wizard is finished. |
| **Setup** | Parameter 1<br>...<br>Parameter N | Once values have been set for these parameters, the measurement should generally be completely configured. |
| | **Advanced setup** | Contains additional submenus and parameters:<br>▪ to adapt the device to special measuring conditions.<br>▪ to process the measured value (scaling, linearization).<br>▪ to configure the signal output. |
| **Diagnostics** | **Diagnostic list** | Contains up to 5 currently active error messages. |
| | **Event logbook** [3] | Contains the last 20 messages (which are no longer active). |
| | **Device information** | Contains information for identifying the device. |
| | **Measured values** | Contains all current measured values. |
| | **Data logging** | Contains the history of the individual measuring values. |
| | **Simulation** | Is used to simulate measured values or output values. |
| | **Device check** | Contains all parameters needed to check the measurement capability of the device. |
| | **Heartbeat** [4] | Contains all the wizards for the **Heartbeat Verification** and **Heartbeat Monitoring** application packages. |
| **Expert** [5]<br>Contains all parameters of the device (including those that are already in one of the other menus). This menu is organized according to the function blocks of the device.<br>The parameters of the Expert menu are described in:<br>GP01017F (FOUNDATION Fieldbus) | **System** | Contains all higher-order device parameters that do not concern the measurement or measured value communication. |
| | **Sensor** | Contains all parameters needed to configure the measurement. |
| | **Output** | Contains all parameters needed to configure the switch output (PFS). |

| Menu | Submenu / parameter | Meaning |
|---|---|---|
| | **Communication** | Contains all parameters needed to configure the digital communication interface. |
| | **Diagnostics** | Contains all parameters needed to detect and analyze operational errors. |

1) If operating via operating tools (e.g. FieldCare), the "Language" parameter is located under "Setup → Advanced setup → Display"
2) Only if operating via an FDT/DTM system
3) only available with local operation
4) only available if operating via DeviceCare or FieldCare
5) On entering the "Expert" menu, an access code is always requested. If a customer specific access code has not been defined, "0000" has to be entered.

### 8.2.2 User roles and related access authorization

The two user roles **Operator** and **Maintenance** have different write access to the parameters if a device-specific access code has been defined. This protects the device configuration via the local display from unauthorized access → 50.

*Access authorization to parameters*

| User role | Read access | | Write access | |
|---|---|---|---|---|
| | Without access code (from the factory) | With access code | Without access code (from the factory) | With access code |
| Operator | ✔ | ✔ | ✔ | -- |
| Maintenance | ✔ | ✔ | ✔ | ✔ |

If an incorrect access code is entered, the user obtains the access rights of the **Operator** role.

The user role with which the user is currently logged on is indicated by the **Access status display** parameter (for display operation) or **Access status tooling** parameter (for tool operation).

### 8.2.3 Data access - Security

#### Write protection via access code

Using the device-specific access code, the parameters for the measuring device configuration are write-protected and their values can no longer be changed via local operation.

#### Define access code via local display

1. Navigate to: Setup → Advanced setup → Administration → Define access code → Define access code
2. Define a max. 4-digit numeric code as an access code.
3. Repeat the same code in **Confirm access code** parameter.
   ↳ The 🔒-symbol appears in front of all write-protected parameters.

#### Define access code via operating tool (e.g. FieldCare)

1. Navigate to: Setup → Advanced setup → Administration → Define access code
2. Define a max. 4-digit numeric code as an access code.
   ↳ Write protection is active.

#### Parameters that can always be changed

The write protection does not include certain parameters that do not affect the measurement. Despite the defined access code, they can always be modified, even if the other parameters are locked.

The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. The device locks the write-protected parameters automatically after 60 s if the user skips back to the measured value display mode from the navigation and editing view.

- If write access is activated via access code, it can be also be deactivated only via the access code → 51.
- In the "Description of Device Parameters" documents, each write-protected parameter is identified with the 🔒-symbol.

### Disabling write protection via access code

If the 🔒-symbol appears on the local display in front of a parameter, the parameter is write-protected by a device-specific access code and its value cannot be changed at the moment using the local display → 📄 50.

The locking of the write access via local operation can be disabled by entering the device-specific access code.

1. After you press E, the input prompt for the access code appears.
2. Enter the access code.
   ↳ The 🔒-symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

### Deactivation of the write protection via access code

#### Via local display

1. Navigate to: Setup → Advanced setup → Administration → Define access code → Define access code
2. Enter **0000**.
3. Repeat **0000** in **Confirm access code** parameter.
   ↳ The write protection is deactivated. Parameters can be changed without entering an access code.

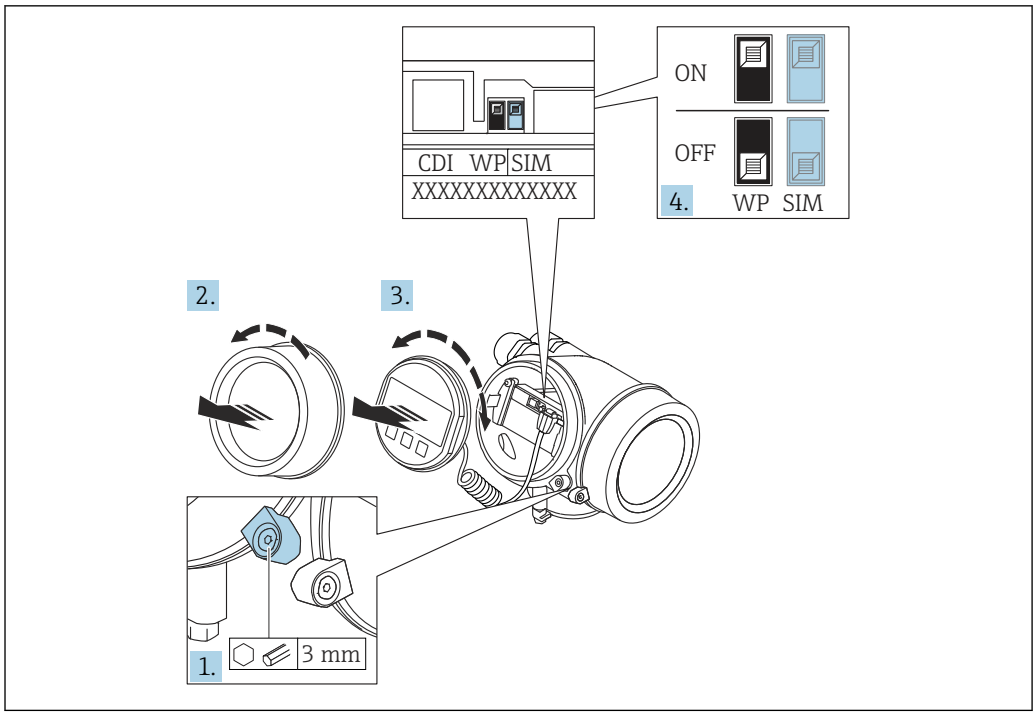
#### Via an operating tool (e.g. FieldCare)

1. Navigate to: Setup → Advanced setup → Administration → Define access code
2. Enter **0000**.
   ↳ The write protection is deactivated. Parameters can be changed without entering an access code.

### Write protection via write protection switch

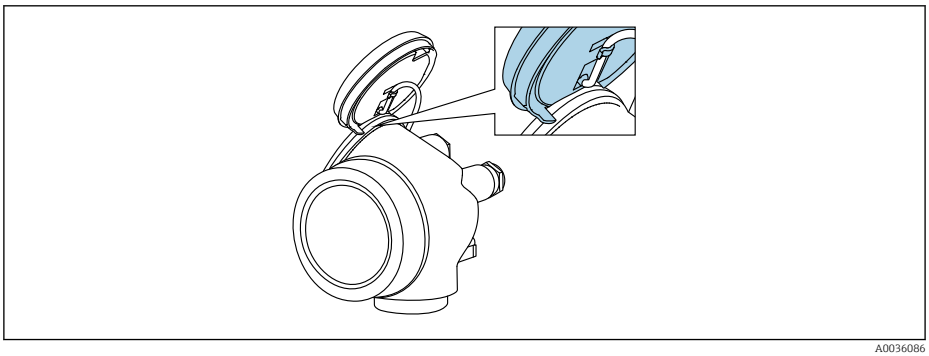
Unlike parameter write protection via a user-specific access code, this allows write access to the entire operating menu - except for the **"Contrast display" parameter** - to be locked.

The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):
- Via local display
- Via FOUNDATION Fieldbus



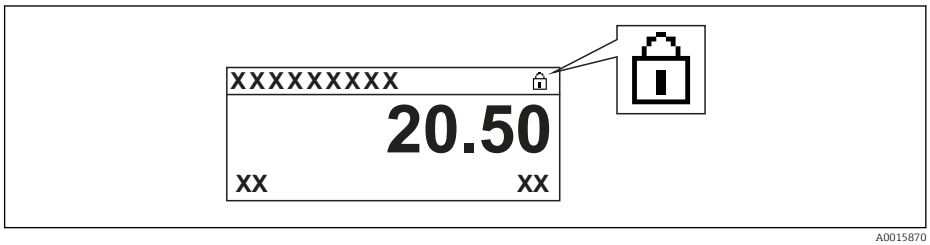

A0021474

1. Loosen the securing clamp.
2. Unscrew the electronics compartment cover.
3. Pull out the display module with a gentle rotational movement. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.



A0036086

4. Setting the write protection switch (WP) on the main electronics module to the **ON** position enables hardware write protection. Setting the write protection switch (WP) on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.
   ↳ If the hardware write protection is enabled: The **Hardware locked** option is displayed in the **Locking status** parameter. In addition, on the local display the 🔒-symbol appears in front of the parameters in the header of the operational display and in the navigation view.




   If the hardware write protection is disabled: No option is displayed in the **Locking status** parameter. On the local display, the 🔒-symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

5. Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment in the desired direction until it engages.
6. Reverse the removal procedure to reassemble the transmitter.

### Enabling and disabling the keypad lock

The keypad lock makes it possible to block access to the entire operating menu via local operation. As a result, it is no longer possible to navigate through the operating menu or change the values of individual parameters. Users can only read the measured values on the operational display.

The keypad lock is switched on and off via the context menu.

*Switching on the keypad lock*

**For the SD03 display only**
The keypad lock is switched on automatically:
- If the device has not been operated via the display for > 1 minute.
- Each time the device is restarted.

**To activate the keylock manually:**

1. The device is in the measured value display.
   Press E for at least 2 seconds.
   ↳ A context menu appears.
2. In the context menu select the **Keylock on** option.
   ↳ The keypad lock is switched on.

If the user attempts to access the operating menu while the keypad lock is active, the message **Keylock on** appears.

*Switching off the keypad lock*

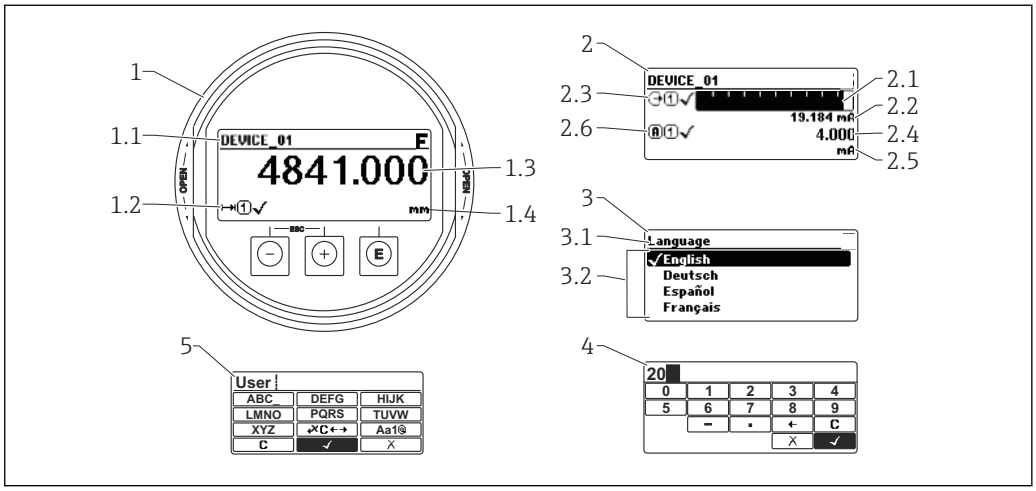
1. The keypad lock is switched on.
   Press E for at least 2 seconds.
   ↳ A context menu appears.
2. In the context menu select the **Keylock off** option.
   ↳ The keypad lock is switched off.

### Bluetooth® wireless technology

**Signal transmission via Bluetooth® wireless technology uses a cryptographic technique tested by the Fraunhofer Institute**
- The device is not visible via *Bluetooth*® wireless technology without the SmartBlue app
- Only one point-to-point connection between **one** sensor and **one** smartphone or tablet is established

## 8.3 Display and operating module

### 8.3.1 Display appearance




20 *Appearance of the display and operation module for on-site operation*

*1 Measured value display (1 value max. size)*
*1.1 Header containing tag and error symbol (if an error is active)*
*1.2 Measured value symbols*
*1.3 Measured value*
*1.4 Unit*
*2 Measured value display (1 bargraph + 1 value)*
*2.1 Bargraph for measured value 1*
*2.2 Measured value 1 (including unit)*
*2.3 Measured value symbols for measured value 1*
*2.4 Measured value 2*
*2.5 Unit for measured value 2*
*2.6 Measured value symbols for measured value 2*
*3 Representation of a parameter (here: a parameter with selection list)*
*3.1 Header containing parameter name and error symbol (if an error is active)*
*3.2 Selection list; ☑ marks the current parameter value.*
*4 Input matrix for numbers*
*5 Input matrix for alphanumeric and special characters*

### Display symbols for the submenus

| Symbol | Meaning |
|---|---|
|  A0018367 | **Display/operation**<br>Is displayed:<br>▪ in the main menu next to the selection "Display/operation"<br>▪ in the header, if you are in the "Display/operation" menu |
|  A0018364 | **Setup**<br>Is displayed:<br>▪ in the main menu next to the selection "Setup"<br>▪ in the header, if you are in the "Setup" menu |
|  A0018365 | **Expert**<br>Is displayed:<br>▪ in the main menu next to the selection "Expert"<br>▪ in the header, if you are in the "Expert" menu |
|  A0018366 | **Diagnostics**<br>Is displayed:<br>▪ in the main menu next to the selection "Diagnostics"<br>▪ in the header, if you are in the "Diagnostics" menu |

### Status signals

| | |
|---|---|
| **F** A0032902 | **"Failure"**<br>A device error is present. The measured value is no longer valid. |
| **C** A0032903 | **"Function check"**<br>The device is in service mode (e.g. during a simulation). |
| **S** A0032904 | **"Out of specification"**<br>The device is operated:<br>▪ Outside of its technical specifications (e.g. during startup or a cleaning)<br>▪ Outside of the configuration carried out by the user (e.g. level outside configured span) |
| **M** A0032905 | **"Maintenance required"**<br>Maintenance is required. The measured value is still valid. |

### Display symbols for the locking state

| Symbol | Meaning |
|---|---|
|  A0013148 | **Display parameter**<br>Marks display-only parameters which can not be edited. |
|  A0013150 | **Device locked**<br>▪ In front of a parameter name: The device is locked via software and/or hardware.<br>▪ In the header of the measured value screen: The device is locked via hardware. |

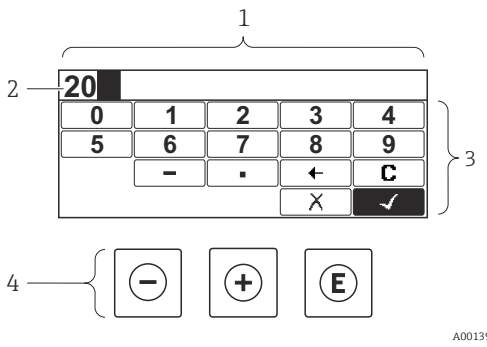
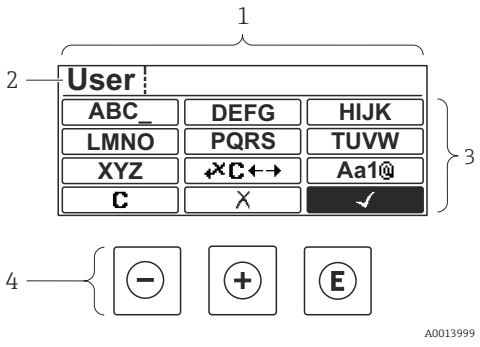
### Measured value symbols

| Symbol | Meaning |
|---|---|
| **Measured values** | |
|  A0032892 | **Level** |
|  A0032893 | **Distance** |
|  A0032908 | **Current output** |
|  A0032894 | **Measured current** |
|  A0032895 | **Terminal voltage** |
|  A0032896 | **Temperature of the electronics or the sensor** |
| **Measuring channels** | |
|  A0032897 | **Measuring channel 1** |
|  A0032898 | **Measuring channel 2** |
| **Status of the measured value** | |
|  A0018361 | **Status "Alarm"**<br>The measurment is interrupted. The output assumes the defined alarm value. A diagnostic message is generated. |
|  A0018360 | **Status "Warning"**<br>The device continues measuring. A diagnostic message is generated. |

### 8.3.2 Operating elements

| Key | Meaning |
|---|---|
|  A0018330 | **Minus key**<br>*For menu, submenu*<br>Moves the selection bar upwards in a picklist.<br>*For text and numeric editor*<br>In the input mask, moves the selection bar to the left (backwards). |
|  A0018329 | **Plus key**<br>*For menu, submenu*<br>Moves the selection bar downwards in a picklist.<br>*For text and numeric editor*<br>In the input mask, moves the selection bar to the right (forwards). |
|  A0018328 | **Enter key**<br>*For measured value display*<br>▪ Pressing the key briefly opens the operating menu.<br>▪ Pressing the key for 2 s opens the context menu.<br>*For menu, submenu*<br>▪ Pressing the key briefly<br>Opens the selected menu, submenu or parameter.<br>▪ Pressing the key for 2 s for parameter:<br>If present, opens the help text for the function of the parameter.<br>*For text and numeric editor*<br>▪ Pressing the key briefly<br>– Opens the selected group.<br>– Carries out the selected action.<br>▪ Pressing the key for 2 s confirms the edited parameter value. |
|  A0032909 | **Escape key combination (press keys simultaneously)**<br>*For menu, submenu*<br>▪ Pressing the key briefly<br>– Exits the current menu level and takes you to the next higher level.<br>– If help text is open, closes the help text of the parameter.<br>▪ Pressing the key for 2 s returns you to the measured value display ("home position").<br>*For text and numeric editor*<br>Closes the text or numeric editor without applying changes. |
|  A0032910 | **Minus/Enter key combination (press and hold down the keys simultaneously)**<br>Reduces the contrast (brighter setting). |
|  A0032911 | **Plus/Enter key combination (press and hold down the keys simultaneously)**<br>Increases the contrast (darker setting). |

### 8.3.3 Entering numbers and text

| Numeric editor | Text editor |
|---|---|
|  |  |



*1 Editing view*
*2 Display area of the entered values*
*3 Input mask*
*4 Operating elements*

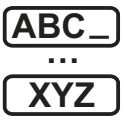
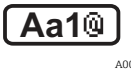
#### Input mask

The following input symbols are available in the input mask of the numeric and text editor:

*Numeric editor symbols*

| Symbol | Meaning |
|---|---|
|  A0013998 | Selection of numbers from 0 to 9. |
|  A0016619 | Inserts decimal separator at the input position. |
|  A0016620 | Inserts minus sign at the input position. |
|  A0013985 | Confirms selection. |
|  A0016621 | Moves the input position one position to the left. |
|  A0013986 | Exits the input without applying the changes. |
|  A0014040 | Clears all entered characters. |

*Text editor symbols*

| Symbol | Meaning |
|---|---|
|  A0013997 | Selection of letters from A to Z |
|  A0013981 | Toggle<br>▪ Between upper-case and lower-case letters<br>▪ For entering numbers<br>▪ For entering special characters |

| | |
|---|---|
|  A0013985 | Confirms selection. |
|  A0013987 | Switches to the selection of the correction tools. |
|  A0013986 | Exits the input without applying the changes. |
|  A0014040 | Clears all entered characters. |

*Correction symbols under*

| Symbol | Meaning |
|---|---|
|  A0032907 | Clears all entered characters. |
|  A0018324 | Moves the input position one position to the right. |
|  A0018326 | Moves the input position one position to the left. |
|  A0032906 | Deletes one character immediately to the left of the input position. |

### 8.3.4 Opening the context menu

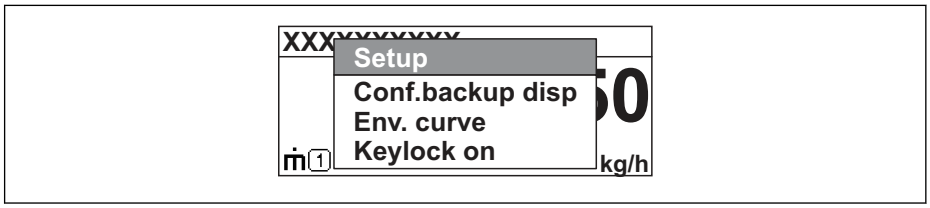
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Env.curve
- Keylock on

#### Opening and closing the context menu

The user is in the operational display.

1. Press E for 2 s.
   ↳ The context menu opens.



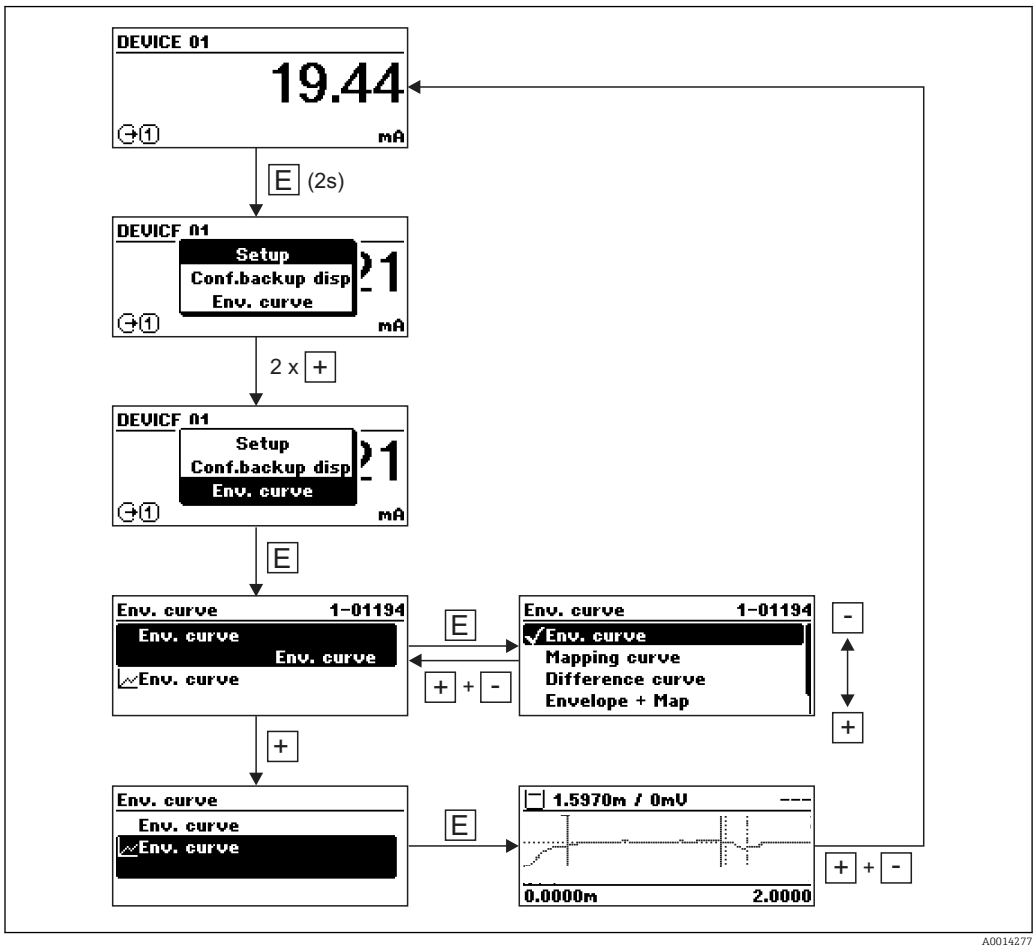

2. Press − + + simultaneously.
   ↳ The context menu is closed and the operational display appears.

#### Calling up the menu via the context menu

1. Open the context menu.
2. Press + to navigate to the desired menu.
3. Press E to confirm the selection.
   ↳ The selected menu opens.

### 8.3.5 Envelope curve on the display and operating module

In order to assess the measuring signal, the envelope curve and - if a mapping has been recorded - the mapping curve can be displayed:



# 9 Integration into a FOUNDATION Fieldbus network

## 9.1 Device Description (DD)

You require the following to configure a device and integrate it into an FF network:
- An FF configuration program
- The Cff file (Common File Format: *.cff)
- The device description (DD) in one of the following formats
  - Device Description format 4 : *sym, *ffo
  - Device Description format 5 : *sy5, *ff5

*Information on the device-specific DD*

| | |
|---|---|
| Manufacturer ID | 0x452B48 |
| Device Type | 0x1028 |
| Device Revision | 0x01 |
| DD Revision | Information and files at:<br>▪ www.endress.com<br>▪ www.fieldcommgroup.org |
| CFF Revision | |

## 9.2 Integration into the FOUNDATION Fieldbus network

- For more in-depth information on integrating the device into the FF system, see the description for the configuration software used.
- When integrating the field devices into the FF system, make sure you are using the right files. You can read out the required version by means of the Device Revision/ DEV_REV and DD Revision/ DD_REV parameters in the Resource Block.

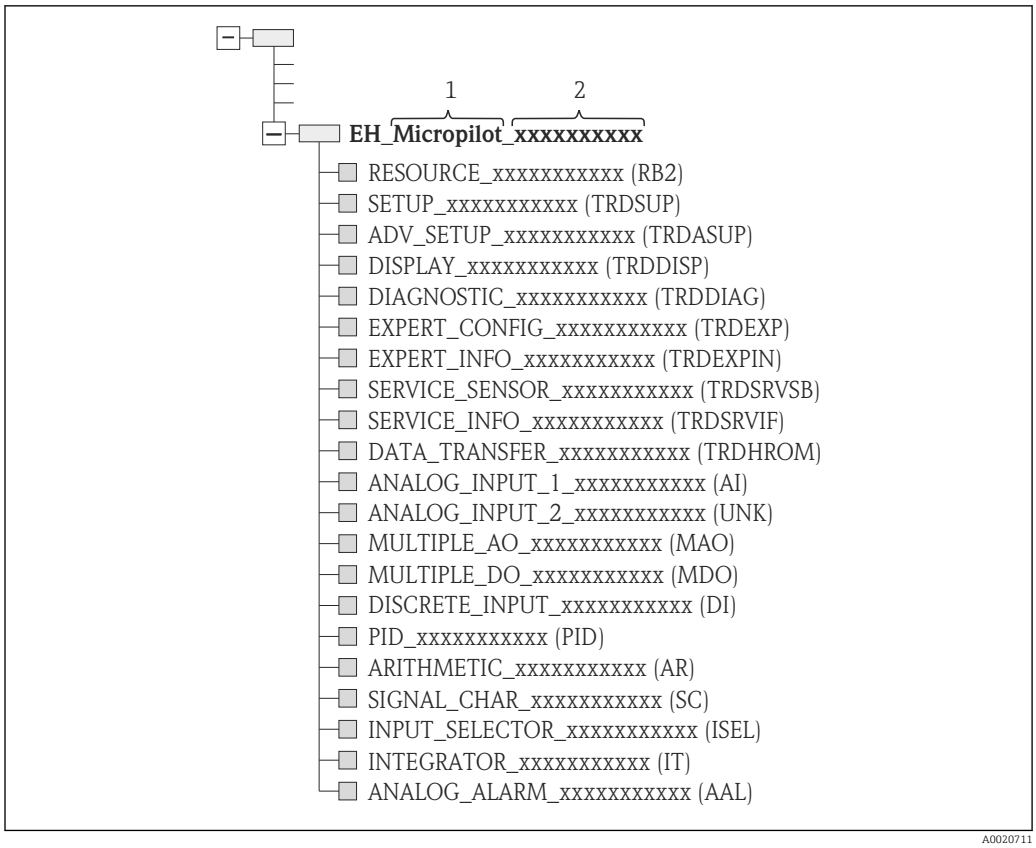
The device is integrated into the FF network as follows:

1. Start the FF configuration program.
2. Download the Cff and device description files (*.ffo, *.sym (for format 4) *ff5, *sy5 (for format 5) to the system.
3. Configure the interface.
4. Configure the device for the measuring task and for the FF system.

## 9.3 Device identification and addressing

FOUNDATION Fieldbus identifies the device using its ID code (Device ID) and automatically assigns it a suitable field address. The identity code cannot be changed. The device appears in the network display once you have started the FF configuration program and integrated the device into the network. The blocks available are displayed under the device name.

If the device description has not yet been loaded, the blocks report "Unknown" or "(UNK)".




*21 Typical display in a configuration program after the connection has been established*

*1 Device name*
*2 Serial number*

## 9.4 Block model

### 9.4.1 Blocks of the device software

The device has the following blocks:
- Resource Block (device block)
- Transducer Blocks
  - Setup Transducer Block (TRDSUP)
  - Advanced Setup Transducer Block (TRDASUP)
  - Display Transducer Block (TRDDISP)
  - Diagnostic Transducer Block (TRDDIAG)
  - Advanced Diagnostic Transducer Block (TRDADVDIAG)
  - Expert Configuration Transducer Block (TRDEXP)
  - Expert Information Transducer Block (TRDEXPIN)
  - Service Sensor Transducer Block (TRDSRVSB)
  - Service Information Transducer Block (TRDSRVIF)
  - Data Transfer Transducer Block (TRDHROM)
- Function Blocks
  - 2 AI Blocks (AI)
  - 1 Discrete Input Block (DI)
  - 1 Multiple Analog Output Block (MAO)
  - 1 Mutliple Discrete Output Block (MDO)
  - 1 PID Block (PID)
  - 1 Arithmetic Block (AR)
  - 1 Signal Characterizer Block (SC)
  - 1 Input Selector Block (ISEL)
  - 1 Integrator Block (IT)
  - 1 Analog Alarm Block (AAL)

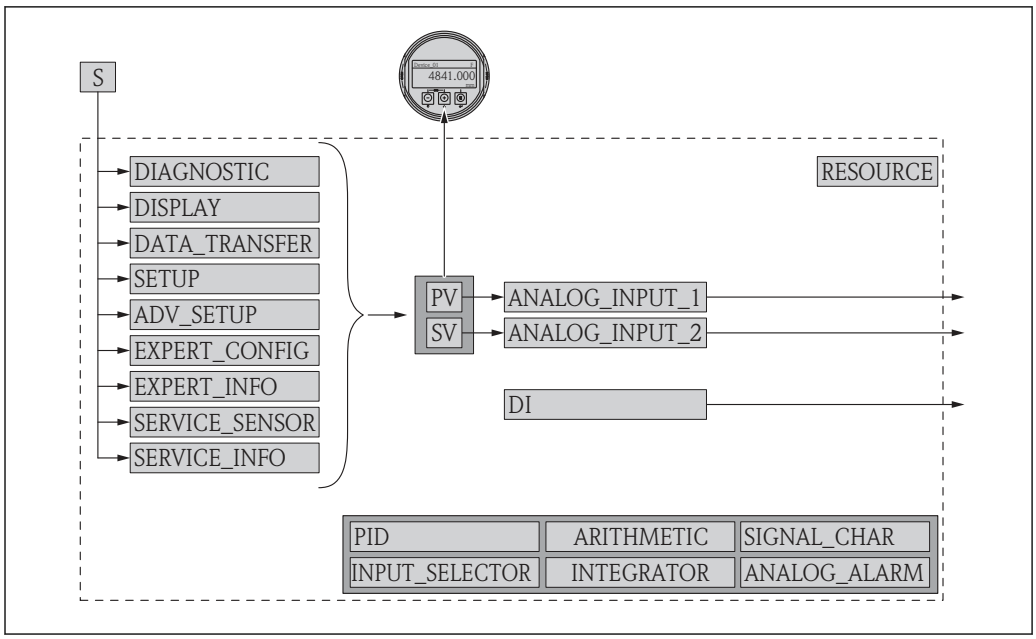
In addition to the pre-instantiated blocks already mentioned, the following blocks can also be instantiated:
- 3 AI Blocks (AI)
- 2 Discrete Input Blocks (DI)
- 1 PID Block (PID)
- 1 Arithemetic Block (AR)
- 1 Signal Characterizer Block (SC)
- 1 Input Selector Block (ISEL)
- 1 Integrator Block (IT)
- 1 Analog Alarm Block (AAL)

Up to 20 blocks can be instantiated in the device altogether, including the blocks already instantiated. For instantiating blocks, see the appropriate Operating Instructions of the configuration program used.

Endress+Hauser Guideline BA00062S.

The guideline provides an overview of the standard function blocks that are described in FOUNDATION Fieldbus Specifications FF 890 - 894. It is designed to help operators use the blocks implemented in the Endress+Hauser field devices.

### 9.4.2 Block configuration when device is delivered




22 *Block configuration when device is delivered*

*S Sensor*
*PV Primary value: Level linearized*
*SV Secondary value: Distance*

## 9.5 Assignment of the measured values (CHANNEL) in an AI Block

The input value of an Analog Input Block is defined by the **CHANNEL** parameter.

| Channel | Measured value |
|---|---|
| 0 | Uninitialized |
| 211 | Terminal voltage |
| 773 | Analog output advance diagnostics 1 |
| 774 | Analog output advance diagnostics 2 |
| 32786 | Absolute echo amplitude |
| 32856 | Distance |
| 32885 | Elektronic temperature |
| 32949 | Level linearized |
| 33044 | Relative echo amplitude |

## 9.6 Index tables of Endress+Hauser parameters

The following tables list the manufacturer-specific device parameters for the Resource Blocks. For the FOUNDATION Fieldbus parameters, see the document BA062S "Guidline - FOUNDATION Fieldbus Function Blocks", which can be downloaded from www.endress.com.

### 9.6.1 Setup Transducer Block

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| operating_mode | Operating mode | 15 | ENUM16 | 2 | Static | Maintenance | OOS |
| distance_unit | Distance unit | 16 | ENUM16 | 2 | Static | Maintenance | OOS |
| tank_type | Tanktyp | 17 | ENUM16 | 2 | Static | Maintenance | OOS |
| tube_diameter | Tube diameter | 18 | FLOAT | 4 | Static | Maintenance | OOS |
| bin_type | Bin type | 19 | ENUM16 | 2 | Static | Maintenance | OOS |
| solid_filling_speed_range | Max. filling speed solid | 20 | ENUM16 | 2 | Static | Maintenance | OOS |
| solid_draining_speed_rang e | Max. draining speed solid | 21 | ENUM16 | 2 | Static | Maintenance | OOS |
| medium_group | Medium group | 22 | ENUM16 | 2 | Static | Maintenance | OOS |
| empty_calibration | Empty calibration | 23 | FLOAT | 4 | Static | Maintenance | OOS |
| full_calibration | Full calibration | 24 | FLOAT | 4 | Static | Maintenance | OOS |
| level_unit_ro | Level unit | 25 | ENUM16 | 2 | Static | Maintenance | OOS |
| PrimLevOut | Primary Value | 26 | Standard | 5 | Dynamic | | |
| output_unit_after_linearizа tion | Unit after linearization | 27 | ENUM16 | 2 | Static | Maintenance | |
| filtered_distance | Distance | 28 | Standard | 5 | Dynamic | | |
| signal_quality | Signalqualität | 29 | ENUM16 | 2 | Dynamic | | |
| confirm_distance | Confirm distance | 30 | ENUM16 | 2 | Static | Maintenance | OOS |
| mapping_start_point | Mapping start point | 31 | FLOAT | 4 | Static | Maintenance | OOS |
| mapping_end_point | Mapping end point | 32 | FLOAT | 4 | Static | Maintenance | OOS |
| end_map_ampl | End map amplitude | 33 | FLOAT | 4 | Static | Maintenance | OOS |
| map_end_x | Present mapping | 34 | FLOAT | 4 | Dynamic | | |
| map_end_y | Map end Y | 35 | FLOAT | 4 | Dynamic | | |
| record_map | Record map | 36 | ENUM16 | 2 | Static | Maintenance | OOS |
| prepare_recording_map | Prepare recording map | 37 | ENUM16 | 2 | Static | Development | OOS |
| end_of_mapping | End of mapping | 38 | ENUM16 | 2 | Static | Maintenance | OOS |
| empty_scale | | 39 | FLOAT | 4 | Static | Maintenance | OOS |
| full_scale | | 40 | FLOAT | 4 | Static | Maintenance | OOS |
| empty_distance | Tank/silo height | 41 | FLOAT | 4 | Static | Maintenance | OOS |
| sw_option_active_overview | Software option overview | 42 | BIT_ENUM32 | 4 | | | |
| sensor_type_ro | Sensor type | 43 | ENUM16 | 2 | Static | Service | OOS |
| medium_type | Medium type | 44 | ENUM16 | 2 | Static | Service | OOS |
| decimal_places_menu | Decimal places menu | 45 | ENUM16 | 2 | Static | Maintenance | AUTO |
| evaluation_mode_ro | Evaluation mode | 46 | ENUM16 | 2 | Dynamic | Maintenance | OOS |
| access_status_tooling | Access status tooling | 47 | ENUM16 | 2 | Dynamic | | |
| locking_status | Locking status | 48 | BIT_ENUM16 | 2 | Dynamic | | |

### 9.6.2 Advanced Setup Transducer Block

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| medium_type | Medium type | 15 | ENUM16 | 2 | Static | Service | OOS |
| medium_property | Medium property | 16 | ENUM16 | 2 | Static | Maintenance | OOS |

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| calculated_dc_value_ee | Calculated DC value | 17 | FLOAT | 4 | Dynamic | Production | AUTO |
| liquid_filling_speed_range | Max. filling speed liquid | 18 | ENUM16 | 2 | Static | Maintenance | OOS |
| liquid_draining_speed_range | Max. draining speed liquid | 19 | ENUM16 | 2 | Static | Maintenance | OOS |
| advanced_process_conditions | Advanced process conditions | 20 | ENUM16 | 2 | Static | Maintenance | OOS |
| level_unit | Level unit | 21 | ENUM16 | 2 | Static | Maintenance | OOS |
| blocking_distance | Blocking distance | 22 | FLOAT | 4 | Static | Maintenance | OOS |
| level_correction | Level correction | 23 | FLOAT | 4 | Static | Maintenance | OOS |
| empry_distance | Tank/silo height | 24 | FLOAT | 4 | Static | Maintenance | OOS |
| linearization_type | Linearization type | 25 | ENUM16 | 2 | Static | Maintenance | OOS |
| unit_after_linearization | Unit after linearization | 26 | ENUM16 | 2 | Static | Maintenance | OOS |
| free_text | Free text | 27 | STRING | | Static | Maintenance | AUTO |
| maximum_value | Maximum value | 28 | FLOAT | 4 | Static | Maintenance | OOS |
| level_linearized_ds | Level linearized | 29 | Standard | 5 | Dynamic | | |
| diameter | Diameter | 30 | FLOAT | 4 | Static | Maintenance | OOS |
| intermediate_height | Intermediate height | 31 | FLOAT | 4 | Static | Maintenance | OOS |
| table_number | Table number | 32 | UINT8 | 1 | Static | Maintenance | OOS |
| table_mode | Table mode | 33 | ENUM16 | 2 | Static | Maintenance | OOS |
| activate_table | Tabelle aktivieren | 34 | ENUM16 | 2 | Static | Maintenance | OOS |
| custom_table_sel_level | Level | 67 | FLOAT | 4 | Static | Maintenance | OOS |
| custom_table_sel_value | Customer value | 68 | FLOAT | 4 | Static | Maintenance | OOS |
| level_semiautomatic | Level | 69 | FLOAT | 4 | Dynamic | | |
| output_echo_lost | Output echo lost | 70 | ENUM16 | 2 | Static | Maintenance | OOS |
| value_echo_lost | Value echo lost | 71 | FLOAT | 4 | Static | Maintenance | OOS |
| ramp_at_echo_lost | Ramp at echo lost | 72 | FLOAT | 4 | Static | Maintenance | OOS |
| switch_output_function | Switch output function | 73 | ENUM16 | 2 | Static | Maintenance | OOS |
| assign_status | Assign status | 74 | ENUM16 | 2 | Static | Maintenance | OOS |
| assign_limit | Assign limit | 75 | ENUM16 | 2 | Static | Maintenance | OOS |
| assign_diag_behavior | Assign diagnostic behavior | 76 | ENUM16 | 2 | Static | Maintenance | OOS |
| switch_on_value | Switch-on value | 77 | FLOAT | 4 | Static | Maintenance | OOS |
| switch_on_delay | Switch-on delay | 78 | FLOAT | 4 | Static | Maintenance | OOS |
| switch_off_value | Switch-off value | 79 | FLOAT | 4 | Static | Maintenance | OOS |
| switch_off_delay | Switch-off delay | 80 | FLOAT | 4 | Static | Maintenance | OOS |
| switch_output_failure_mode | Failure mode | 81 | ENUM16 | 2 | Static | Maintenance | OOS |
| switch_status | Switch status | 82 | ENUM16 | 2 | Dynamic | | |
| invert_output_signal | Invert output signal | 83 | ENUM16 | 2 | Static | Maintenance | OOS |

### 9.6.3 Display Transducer Block

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| locking_status_display | Locking status | 15 | ENUM16 | 2 | Dynamic | | |
| access_status_display | Access status display | 16 | ENUM16 | 2 | Dynamic | | |

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| access_code_for_display | Enter access code | 17 | UINT16 | 2 | Static | Operator | AUTO |
| define_access_code | Freigabecode definieren | 18 | UINT16 | 2 | Static | Maintenance | AUTO |
| language | Language | 19 | ENUM16 | 2 | Static | Operator | AUTO |
| foramt_display | Format display | 20 | ENUM16 | 2 | Static | Operator | AUTO |
| value_1_display | Value 1 display | 21 | ENUM16 | 2 | Static | Maintenance | AUTO |
| decimal_places_1 | Decimal places 1 | 22 | ENUM16 | 2 | Static | Maintenance | AUTO |
| value_2_display | Value 2 display | 23 | ENUM16 | 2 | Static | Maintenance | AUTO |
| decimal_places_2 | Decimal places 2 | 24 | ENUM16 | 2 | Static | Maintenance | AUTO |
| value_3_display | Value 3 display | 25 | ENUM16 | 2 | Static | Maintenance | AUTO |
| decimal_places_3 | Decimal places 3 | 26 | ENUM16 | 2 | Static | Maintenance | AUTO |
| value_4_display | Value 4 display | 27 | ENUM16 | 2 | Static | Maintenance | AUTO |
| decimal_places_4 | Decimal places 4 | 28 | ENUM16 | 2 | Static | Maintenance | AUTO |
| display_interval | Display interval | 29 | FLOAT | 4 | Static | Operator | AUTO |
| display_damping | Display damping | 30 | FLOAT | 4 | Static | Maintenance | AUTO |
| header | Header | 31 | ENUM16 | 2 | Static | Maintenance | AUTO |
| header_text | Header text | 32 | STRING | 12 | Static | Maintenance | AUTO |
| display_separator | Separator | 33 | ENUM16 | 2 | Static | Maintenance | AUTO |
| number_format | Zahlenformat | 34 | ENUM16 | 2 | Static | Maintenance | AUTO |
| decimal_places_menu | Decimal places menu | 35 | ENUM16 | 2 | Static | Maintenance | AUTO |
| contrast_display | Contrast display | 36 | FLOAT | 4 | Static | Operator | AUTO |
| backlight | Backlight | 37 | ENUM16 | 2 | Static | Operator | AUTO |
| operating_time | Operating time | 38 | STRING | 14 | Dynamic | | |
| last_backup | Last backup | 39 | STRING | 14 | Static | Production | AUTO |
| configuration_management | Configuration management | 40 | ENUM16 | 2 | Static | Maintenance | AUTO |
| comparison_result | Comparison result | 41 | ENUM16 | 2 | Static | Production | AUTO |

### 9.6.4 Diagnostic Transducer Block

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| actual diagnostics | Actual diagnostics | 15 | UINT32 | 4 | Dynamic | | |
| present_timestamp | Timestamp | 16 | STRING | 14 | Dynamic | | |
| previous diagnostics | Letzte Diagnose | 17 | UINT32 | 4 | Dynamic | | |
| previous_timestamp | Timestamp | 18 | STRING | 14 | Dynamic | | |
| operating_time_from_restart | Operating time from restart | 19 | STRING | 14 | Dynamic | | |
| operating_time | Operating time | 20 | STRING | 14 | Dynamic | | |
| diagnostics_1 | Diagnostics 1 | 21 | UINT32 | 4 | Dynamic | | |
| diag_1_timestamp | Timestamp | 22 | STRING | 14 | Dynamic | | |
| diagnostics_2 | Diagnostics 2 | 23 | UINT32 | 4 | Dynamic | | |
| diag_2_timestamp | Timestamp | 24 | STRING | 14 | Dynamic | | |
| diagnostics_3 | Diagnostics 3 | 25 | UINT32 | 4 | Dynamic | | |
| diag_3_timestamp | Timestamp | 26 | STRING | 14 | Dynamic | | |
| diagnostics_4 | Diagnostics 4 | 27 | UINT32 | 4 | Dynamic | | |

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| diag_4_timestamp | Timestamp | 28 | STRING | 14 | Dynamic | | |
| diagnostics_5 | Diagnostics 5 | 29 | UINT32 | 4 | Dynamic | | |
| diag_5_timestamp | Timestamp | 30 | STRING | 14 | Dynamic | | |
| filter_options | Filter options | 31 | ENUM8 | 1 | Static | Maintenance | AUTO |
| clear_event_list | Clear event list | 32 | ENUM16 | 2 | Static | Service | AUTO |
| simulation_distance_ro | Simulation distance | 33 | ENUM16 | 2 | Static | Development | AUTO |
| value_of_simulated_distance | Vaue of simulated distance | 34 | FLOAT | 4 | Static | Maintenance | AUTO |
| assign_sim_meas | Assign measurement variable | 35 | ENUM16 | 4 | Static | Maintenance | OOS |
| sim_value_process_variable | Value process variable | 36 | FLOAT | 4 | Static | Maintenance | OOS |
| switch_output_simulation | Switch output simulation | 37 | ENUM16 | 2 | Static | Maintenance | OOS |
| sim_switch_status | Switch status | 38 | ENUM16 | 2 | Static | Maintenance | AUTO |
| simulation_device_alarm | Simulation device alarm | 39 | ENUM16 | 2 | Static | Maintenance | OOS |
| simulation_diagnostic_event | Simulation diagnostic event | 40 | UINT32 | 4 | Static | Service | OOS |
| start_device_check | Start device check | 41 | ENUM16 | 2 | Static | Maintenance | AUTO |
| result_device_check | Result device check | 42 | ENUM16 | 2 | Static | Development | AUTO |
| last_check_time | Last check time | 43 | STRING | 14 | Dynamic | | |
| level_signal | Level signal | 44 | ENUM16 | 2 | Static | Development | AUTO |
| device_check_timestamp | Timestamp | 45 | UINT32 | 14 | Static | Development | AUTO |
| assign_channel_1 | Assign channel 1 | 54 | ENUM16 | 2 | Static | Maintenance | AUTO |
| assign_channel_2 | Assign channel 2 | 55 | ENUM16 | 2 | Static | Maintenance | AUTO |
| assign_channel_3 | Assign channel 3 | 56 | ENUM16 | 2 | Static | Maintenance | AUTO |
| assign_channel_4 | Assign channel 4 | 57 | ENUM16 | 2 | Static | Maintenance | AUTO |
| logging_interval | Logging interval | 58 | FLOAT | 4 | Static | Maintenance | AUTO |
| clear_logging_data | Clear logging data | 59 | ENUM16 | 2 | Static | Maintenance | AUTO |
| alarm_delay | Alarm delay | 60 | FLOAT | 4 | Static | Maintenance | AUTO |

### 9.6.5 Expert Configuration Transducer Block

The parameters of the **Expert Configuration Transducer Block** are described in GP01017F: "Micropilot FMR5x - Description of Device Parameters - FOUNDATION Fieldbus"

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| locking status | Locking status | 15 | ENUM16 | 2 | | | |
| access_status_tooling | Access status tooling | 16 | ENUM16 | 2 | | | |
| enter_access_code | Enter access code | 17 | UINT16 | 2 | Static | Operator | AUTO |
| distance_unit_ro | Distance unit | 18 | ENUM16 | 2 | Static | Maintenance | OOS |
| operating_mode_ro | Operating mode | 19 | ENUM16 | 2 | Static | Maintenance | OOS |
| free_field_special | Free field special | 20 | ENUM16 | 2 | Static | Maintenance | OOS |
| sensor_type | Sensor type | 21 | ENUM16 | 2 | Static | Service | OOS |
| distance_offset | Distance offset | 22 | FLOAT | 4 | Static | Maintenance | OOS |
| level_unit_ro | Level unit | 23 | ENUM16 | 2 | Static | Maintenance | OOS |

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| level_limit_mode | Level limit mode | 24 | ENUM16 | 2 | Static | Maintenance | OOS |
| level_high_limit | High limit | 25 | FLOAT | 4 | Static | Maintenance | OOS |
| level_low_limit | Low limit | 26 | FLOAT | 4 | Static | Maintenance | OOS |
| output_mode | Output mode | 27 | ENUM16 | 2 | Static | Maintenance | OOS |
| filter_dead_time | Dead time | 28 | FLOAT | 4 | Static | Maintenance | OOS |
| integration_time | Integration time | 29 | FLOT | 4 | Static | Maintenance | OOS |
| velocity_filter | Geschwindigkeitfilter | 30 | ENUM16 | 2 | Static | Service | OOS |
| gpc_mode | GPC mode | 31 | ENUM16 | 2 | Static | Maintenance | OOS |
| external_pressure_selector | External pressure selector | 32 | ENUM16 | 2 | Static | Maintenance | OOS |
| gas_phase_compens_factor | Gas phase compensation factor | 33 | FLOAT | 4 | Static | Maintenance | OOS |
| reference_distance | Reference distance | 34 | FLOAT | 4 | Static | Maintenance | OOS |
| present_reference_distance | Present reference distance | 35 | FLOAT | 4 | Dynamic | | |
| reference_echo_threshold | Reference echo threshold | 36 | FLOAT | 4 | Static | Maintenance | OOS |
| const_gpc_factor | Const. GPC factor | 37 | FLOAT | 4 | Static | Maintenance | OOS |
| external_pressure | External pressure | 38 | FLOAT | 4 | Static | Development | AUTO |
| start_self_check | Start self check | 39 | ENUM16 | 2 | Static | Maintenance | AUTO |
| result_self_check | Result self check | 40 | ENUM16 | 2 | Static | Development | AUTO |
| delay_time_echo_lost | Delay time echo lost | 41 | FLOAT | 4 | Static | Maintenance | OOS |
| safety_distance | Sicherheitsdistanz | 42 | FLOAT | 4 | Static | Maintenance | OOS |
| in_safety_distance | In safety distance | 43 | ENUM16 | 2 | Static | Maintenance | OOS |
| acknowledge_alarm | Acknowledge alarm | 44 | ENUM16 | 2 | Static | Maintenance | AUTO |
| evaluation_mode | Evaluation mode | 45 | ENUM16 | 2 | Static | Maintenance | OOS |
| history_reset | History reset | 46 | ENUM16 | 2 | Static | Maintenance | OOS |
| history_learning_control | History learning control | 47 | ENUM16 | 2 | Static | Maintenance | OOS |
| history_learning | History learning | 48 | ENUM16 | 2 | Static | Maintenance | OOS |
| level_external_input_1 | Level external input 1 | 49 | ENUM16 | 2 | Static | Maintenance | OOS |
| function_input_1_level | Function input 1 level | 50 | ENUM16 | 2 | Static | Maintenance | OOS |
| fixed_value_input_1 | Fixed value input 1 | 51 | FLOAT | 4 | Static | Maintenance | OOS |
| binary_input_1_level_control | Binary input 1 level control | 52 | ENUM16 | 2 | Static | Maintenance | OOS |
| level_external_input_2 | Level external input 2 | 53 | ENUM16 | 2 | Static | Maintenance | OOS |
| function_input_2_level | Function input 2 level | 54 | ENUM16 | 2 | Static | Maintenance | OOS |
| fixed_value_input_2 | Fixed value input 2 | 55 | FLOAT | 4 | Static | Maintenance | OOS |
| binary_input_2_level_control | Binary input 2 level control | 56 | ENUM16 | 2 | Static | Maintenance | OOS |
| control_measurement | Control measurement | 57 | ENUM16 | 2 | Static | Maintenance | OOS |
| measurement_on | Measurement | 58 | ENUM16 | 2 | Static | Maintenance | OOS |
| sensor_module | Sensor module | 59 | ENUM16 | 2 | Static | Development | AUTO |
| sensor_module_ee | Sensor module | 60 | ENUM16 | 2 | Static | Production | OOS |
| decimal_places_menu_ro | Decimal places menu | 61 | ENUM16 | 2 | Static | Maintenance | AUTO |
| sw_option_active_overview | Software option active overview | 62 | BIT_ENUM32 | 4 | | | |
| fieldbus_type | Feldbustyp | 63 | ENUM8 | 1 | | | |
| medium_type_ro | Medium type | 64 | ENUM16 | 2 | Static | Service | OOS |

### 9.6.6 Expert Information Transducer Block

The parameters of the **Expert Information Transducer Block** are described in GP01017F: "Micropilot FMR5x - Description of Device Parameters - FOUNDATION Fieldbus"

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| abs_echo_ampl | Absolute echo amplitude | 15 | Standard | 5 | | | |
| rel_echo_ampl | Relative echo amplitude | 16 | Standard | 5 | Dynamic | | |
| rel_eop_ampl | Tank bottom echo amplitude | 17 | Standard | 5 | Dynamic | | |
| noise_signal_val | Noise of signal | 18 | FLOAT | 4 | Dynamic | | |
| electronic_temperature | Electronic temperature | 19 | Standard | 5 | Dynamic | | |
| found_echoes | Found echoes | 20 | ENUM16 | 2 | Dynamic | | |
| temperature_unit | Temperature unit | 21 | ENUM16 | 2 | Static | Maintenance | OOS |
| max_electr_temp | Max. electronic temperature | 22 | FLOAT | 4 | Static | Development | AUTO |
| application_parameter | Application parameter | 23 | ENUM16 | 2 | Dynamic | | |
| time_max_electr_temp | Time max. electronics temperature | 24 | STRING | 14 | Dynamic | | |
| measurement_frequency | Measurement frequency | 25 | FLOAT | 4 | Dynamic | | |
| min_electr_temp | Min. electronics temperature | 26 | FLOAT | 4 | Static | Development | AUTO |
| time_min_electr_temp | Time min. electronics temperaturer | 27 | STRING | 14 | Dynamic | | |
| reset_min_max_temp | Reset min/max. Temp. | 28 | ENUM16 | 2 | Static | Service | AUTO |
| used_calculation | Used calculation | 29 | ENUM16 | 2 | Dynamic | | |
| tank_trace_state | Status Tanktrace | 30 | ENUM16 | 2 | Dynamic | | |
| max_draining_speed | Max. draining speed | 31 | FLOAT | 4 | Static | Development | AUTO |
| max_filling_speed | Max. filling speed | 32 | FLOAT | 4 | Static | Entwicklung | AUTO |
| time_max_level | Time max. level | 33 | STRING | 14 | Dynamic | | |
| max_level_value | Max. level value | 34 | FLOAT | 4 | Static | Development | AUTO |
| time_min_level | Time min. level | 35 | STRING | 14 | Dynamic | | |
| min_level_value | Min. level | 36 | FLOAT | 4 | Static | Development | AUTO |
| reset_min_max | Reset min./max. | 37 | ENUM16 | 2 | Static | Service | AUTO |
| appl_param_changed_flags | Application parameter | 38 | UINT16 | 2 | Static | Production | AUTO |
| terminal_voltage_ds | Terminal voltage | 39 | Standard | 5 | Dynamic | | |
| area_of_incoupling | Area of incoupling | 40 | Standard | 5 | Dynamic | | |
| linearization_type_ro | Linearization type | 41 | ENUM16 | 2 | Static | Maintenance | OOS |
| operating_mode | Operating mode | 42 | ENUM16 | 2 | Static | Maintenance | OOS |
| decimal_places_menu_ro | Decimal places menu | 43 | ENUM16 | 2 | Static | Maintenance | AUTO |
| activat_sw_option | Activate SW option | 44 | UINT32 | 4 | Static | Maintenance | AUTO |
| sw_option_active_overview | Sw option active overview | 45 | BIT_ENUM32 | 4 | Dynamic | | |
| debug_status | | 107 | UINT8 | 1 | Dynamic | x | AUTO |

### 9.6.7 Service Sensor Transducer Block

The parameters of the **Service Sensor** Transducer Block can only be operated by authorized Endress+Hauser service personnel.

### 9.6.8 Service Information Transducer Block

The parameters of the **Service Information** Transducer Block can only be operated by authorized Endress+Hauser service personnel.

### 9.6.9 Advanced Diagnostics Transducer Block

The parameters of the **Advanced Diagnostics Transducer Block** are described in GP01017F: "Micropilot FMR5x - Description of Device Parameters - FOUNDATION Fieldbus"

| Name | Label | Index | Data type | Size (Bytes) | Storage Class | Write access | MODE_BLK |
|---|---|---|---|---|---|---|---|
| assign_diag_signal_ad1 | Assign diagnostic signal 1 | 15 | ENUM16 | 2 | Static | Maintenance | OOS |
| link_ad1_to | Link AD1 to | 16 | ENUM16 | 2 | Static | Maintenance | OOS |
| linking_logic_ad1 | Linking logic AD1 | 17 | ENUM16 | 2 | Static | Maintenance | OOS |
| sample_time_ad1 | Sample time 1 | 18 | UINT16 | 2 | Static | Maintenance | OOS |
| calc_type_ad1 | Calculation type 1 | 19 | ENUM16 | 2 | Static | Maintenance | OOS |
| check_mode_ad1 | Check mode 1 | 20 | ENUM16 | 2 | Static | Maintenance | OOS |
| calculation_unit_ad1 | Calculation unit 1 | 21 | ENUM16 | 2 | Static | Operator | OOS |
| upper_limit_ad1 | Upper limit 1 | 22 | FLOAT | 4 | Static | Maintenance | OOS |
| lower_limit_ad1 | Lower limit 1 | 23 | FLOAT | 4 | Static | Maintenance | OOS |
| hysteresis_ad1 | Hysteresis 1 | 24 | FLOAT | 4 | Static | Maintenance | OOS |
| max_value_ad1 | Maximum value 1 | 25 | FLOAT | 4 | Dynamic | | |
| min_value_ad1 | Minimum value 1 | 26 | FLOAT | 4 | Dynamic | | |
| reset_min_max_ad1 | Reset min./max. 1 | 27 | ENUM16 | 2 | Static | Maintenance | AUTO |
| assign_status_sig_ad1 | Assign status signal to AD event 1 | 28 | ENUM16 | 2 | Static | Maintenance | OOS |
| assign_event_behaviour_ad1 | Assign event behaviourn 1 | 29 | ENUM16 | 2 | Static | Maintenance | OOS |
| alarm_delay_ad1 | Alarm delay | 30 | FLOAT | 4 | Static | Maintenance | OOS |
| assign_diag_ signal_ad2 | Assign diagnostic signal 2 | 31 | ENUM16 | 2 | Static | Maintenance | OOS |
| link_ad2_to | Link AD2 to | 32 | ENUM16 | 2 | Static | Maintenance | OOS |
| linking_logic_ad2 | Linking logic AD2 | 33 | ENUM16 | 2 | Static | Maintenance | OOS |
| sample_time_ad2 | Sample time 2 | 34 | UINT16 | 2 | Static | Maintenance | OOS |
| calc_type_ad2 | Calculation type 2 | 35 | ENUM16 | 2 | Static | Maintenance | OOS |
| check_mode_ad2 | Check mode 2 | 36 | ENUM16 | 2 | Static | Maintenance | OOS |
| calculation_unit_ad2 | Calculation unit 2 | 37 | ENUM16 | 2 | Static | Operator | OOS |
| upper_limit_ad2 | Upper limit 2 | 38 | FLOAT | 4 | Static | Maintenance | OOS |
| lower_limit_ad2 | Lower limit 2 | 39 | FLOAT | 4 | Static | Maintenance | OOS |
| hysteresis_ad2 | Hysteresis 2 | 40 | FLOAT | 4 | Static | Maintenance | OOS |
| max_value_ad2 | Maximum value 2 | 41 | FLOAT | 4 | Dynamic | | |
| min_value_ad2 | Minimum value 2 | 42 | FLOAT | 4 | Dynamic | | |
| reset_min_max_ad2 | Reset min./max. 2 | 43 | ENUM16 | 2 | Static | Maintenance | AUTO |
| assign_status_sig_ad2 | Assign status signal to AD event 2 | 44 | ENUM16 | 2 | Static | Maintenance | OOS |
| assign_event_behaviour_ad2 | Assign event behaviour 2 | 45 | ENUM16 | 2 | Static | Maintenance | OOS |
| alarm_delay_ad2 | Alarm delay 2 | 46 | FLOAT | 4 | Static | Maintenance | OOS |

## 9.7 Methods

The FOUNDATION Fieldbus Specification includes the use of methods to make device operation easier. A method is a sequence of interactive steps to be carried out in the specified order so as to configure certain device functions.

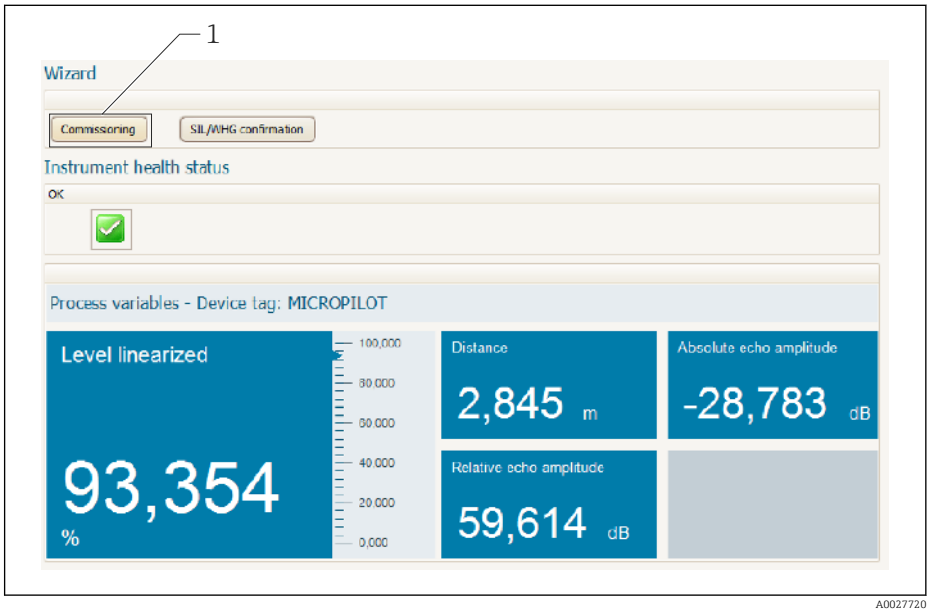
The following methods are available for the device:

- **Restart**
  This method is located in the Resource Block and directly prompts the setting of the **Device reset** parameter. This resets the device configuration to a defined state.
- **ENP Restart**
  This method is located in the Resource Block and directly prompts the setting of the parameters of the Electronic Name Plate (ENP).
- **Setup**
  This method is located in the SETUP Transducer Block and allows to set the most important parameters in this block for device configuration (measuring units, type of tank or vessel, type of medium, empty and full calibration).
- **Linearization**
  This method is located in the ADV_SETUP Transducer Block and allows to manage the linearization table by which the measured value is converted into volume, mass or flow.
- **Self Check**
  This method is located in the EXPERT_CONFIG Transducer Block and prompts the device self check parameters.

# 10 Commissioning via wizard

A wizard guiding the user through the initial setup is available in FieldCare and DeviceCare [4].

1. Connect the device to FieldCare or DeviceCare → 46.
2. Open the device in FieldCare or DeviceCare.
   ↳ The dashboard (home page) of the device appears:




A0027720

*1 "Commissioning" button calls up the wizard.*

3. Click on "Commissioning" to call up the wizard.
4. Enter or select the appropriate value for each parameter. These values are immediately written to the device.
5. Click "Next" to switch to the next page.
6. After finishing the last page, click "End of sequence" to close the wizard.

If the wizard is cancelled before all necessary parameters have been set, the device may be in an undefined state. A reset to the default settings is recommended in this case.

4) DeviceCare is available for download at www.software-products.endress.com. The download requires a registration in the Endress+Hauser software portal.

# 11 Commissioning via operating menu

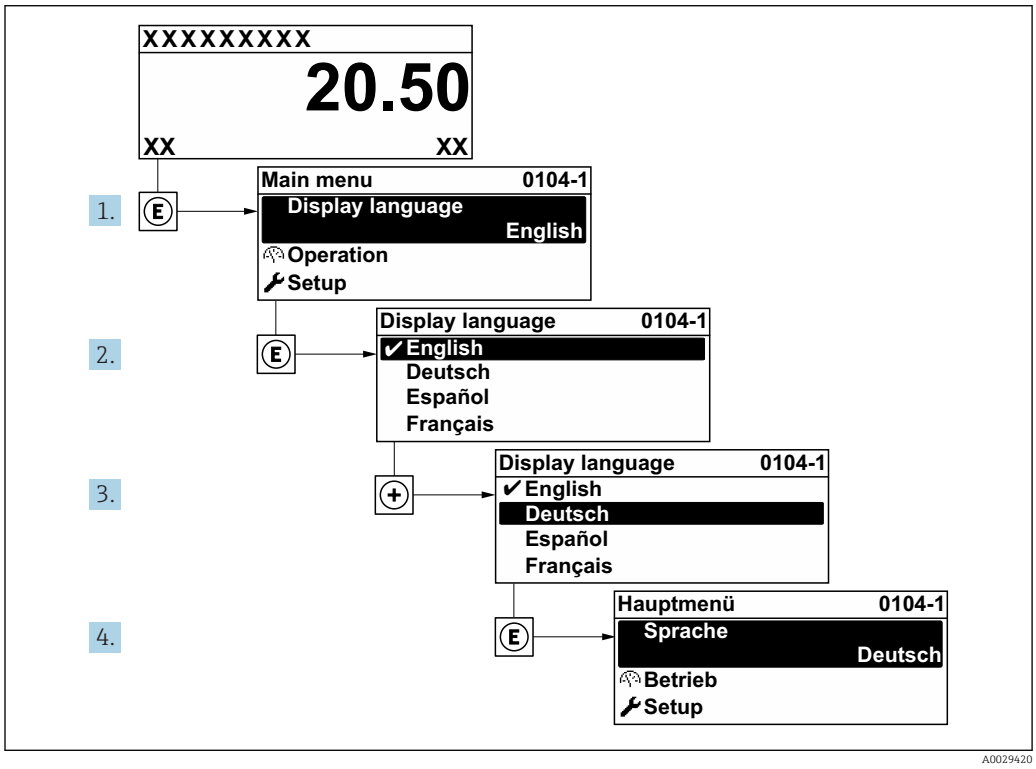
## 11.1 Installation and function check

Make sure that all final checks have been completed before you start up your measuring point:

- Checklist "Post-installation check" → 35
- Checklist "Post-connection check" → 43

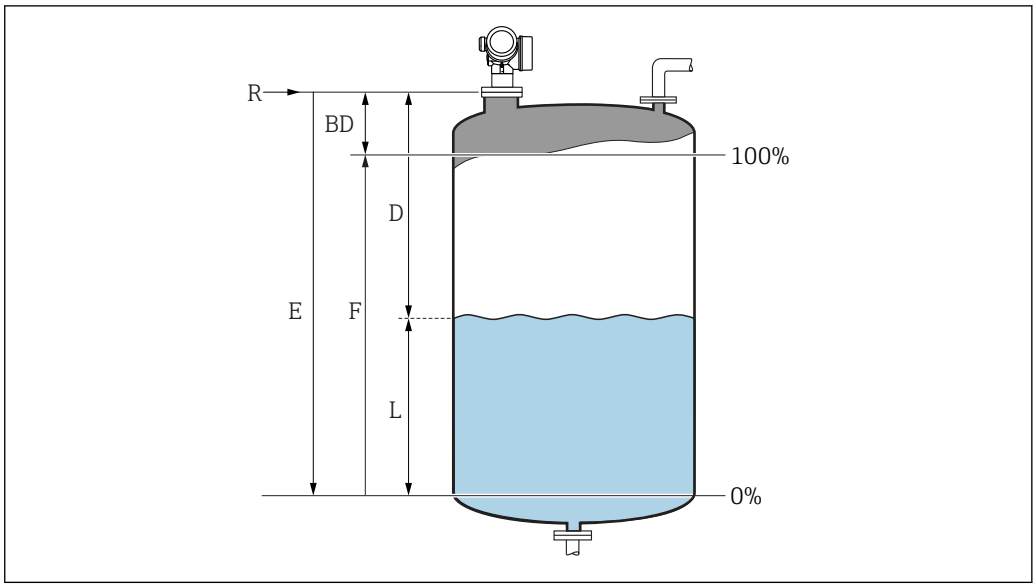
## 11.2 Setting the operating language

Factory setting: English or ordered local language




23 *Using the example of the local display*

## 11.3 Configuration of a level measurement




24 *Configuration parameters for level measurements in liquids*

*R Reference point of the measurement*
*D Distance*
*L Level*
*E Empty calibration (= zero)*
*F Full calibration (= span)*

1. Navigate to: Setup → Device tag
   ↳ Enter device tag.
2. Navigate to: Setup → Distance unit
   ↳ Select distance unit.
3. Navigate to: Setup → Tank type
   ↳ Select tank type.
4. For **Tank type** parameter = Bypass / pipe:
   Navigate to: Setup → Tube diameter
   ↳ Enter the diameter of the stilling well or bypass.
5. Navigate to: Setup → Medium group
   ↳ Specify medium group: (**Water based (DC >= 4)** or **Others**)
6. Navigate to: Setup → Empty calibration
   ↳ Enter empty distance E (Distance from reference point R to the 0% level) [5].
7. Navigate to: Setup → Full calibration
   ↳ Enter full distance F (Distance from the 0% to the 100% level).
8. Navigate to: Setup → Level
   ↳ Indicates the measrued level L.
9. Navigate to: Setup → Distance
   ↳ Indicates the measured distance from the reference point R to the level L.
10. Navigate to: Setup → Signal quality
    ↳ Indicates the quality of the evaluated level echo.

5) If, for example, the measuring range covers only an upper part of the tank (E << tank height), it is mandatory to enter the acutal tank height into the "Setup → Advanced Setup → Level → Tank/silo height" parameter.

11. When operating via local display:
    Navigate to: Setup → Mapping → Confirm distance
    ↳ Compare distance indicated on the display to real distance in order to start the recording of an interference echo map.
12. When operating via operating tool:
    Navigate to: Setup → Confirm distance
    ↳ Compare distance indicated on the display to real distance in order to start the recording of an interference echo map.
13. Navigate to: Setup → Advanced setup → Level → Level unit
    ↳ Select level unit: %, m, mm, ft, in (Factory setting: %)

The response time of the device is preset by the **Tank type** parameter (→ 131). More detailed settings are possible in the **Advanced setup** submenu.

## 11.4 Recording the reference curve

After the configuration of the measurement it is recommended to record the current envelope curve as a reference curve. The reference curve can be used later on in the process for diagnostic purposes. To record the reference curve use the **Save reference curve** parameter.

**Navigation in the menu**
Expert → Diagnostics → Envelope diagnostics → Save reference curve

**Meaning of the options**
- No
  No action
- Yes
  The current envelope curve is saved as reference curve.

In devices which have been delivered with software version 01.00.zz, this submenu is only visible for the "Service" user role.

The reference curve can only be displayed in the envelope curve diagram of FieldCare after it has been loaded from the device into FieldCare. This is performed by the "Load Reference Curve" function in FieldCare.



25 *The "Load Reference Curve" function*

## 11.5 Configuration of the on-site display

### 11.5.1 Factory settings of the on-site display

| Parameter | Factory setting |
|---|---|
| Format display | 1 value, max. size |
| Value 1 display | Level linearized |
| Value 2 display | None |
| Value 3 display | None |
| Value 4 display | None |

### 11.5.2 Adjustment of the on-site display

The on-site display can be adjusted in the following submenu:
Setup → Advanced setup → Display

## 11.6 Configuration management

After commissioning, you can save the current device configuration, copy it to another measuring point or restore the previous device configuration. You can do so using the **Configuration management** parameter and its options.

**Navigation path in the operating menu**
Setup → Advanced setup → Configuration backup display → Configuration management

**Meaning of the options**
- **Cancel**
  No action is executed and the user exits the parameter.
- **Execute backup**
  A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device. The backup copy comprises the transmitter and sensor data of the device.
- **Restore**
  The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter and sensor data of the device.
- **Duplicate**
  The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point are **not** included in the transmitted configuration:
  Medium type
- **Compare**
  The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the **Comparison result** parameter.
- **Clear backup data**
  The backup copy of the device configuration is deleted from the display module of the device.

While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

If an existing backup is restored to a different device using the **Restore** option, it may occur that some device functionalities are no longer available. In some cases even a device reset → 177 will not restore the original status..

In order to transmit a configuration to a different device, the **Duplicate** option should always be used.

## 11.7 Protection of the settings against unauthorized changes

There are two ways to protect the settings against unauthorized changes:

- Via parameter settings (software locking) → 📄 50
- Via locking switch (hardware locking) → 📄 51

# 12 Commissioning (block-based operation)

## 12.1 Function check

Carry out a post-installation and a post-connection check as per the checklist before commissioning the device:

- "Post-installation check" checklist → 35
- "Post-connection check" checklist → 43

## 12.2 Block configuration

### 12.2.1 Preparatory steps

1. Switch on the device.
2. Note the DEVICE_ID → 63.
3. Open the FOUNDATION Fieldbus configuration program.
4. Load Cff and device description files into the host system or the configuration program. Make sure you are using the right system files.
5. Identify the device using the **DEVICE_ID** (see Point 2). Assign the desired tag name to the device by means of the **Pd-tag/FF_PD_TAG** parameter.

### 12.2.2 Configuring the Resource Block

1. Open the Resource Block.
2. If necessary, disable the lock for device operation.
3. If necessary, change the block name. Factory setting: RS-xxxxxxxxxxx (RB2)
4. If necessary, assign a description to the block by means of the **Tag Description/ TAG_DESC** parameter.
5. If necessary, change other parameters as per the requirements.

### 12.2.3 Configuring the Transducer Blocks

The measurement and the display module are configured using the Transducer Blocks. The general procedure is the same for all Transducer Blocks:

1. If necessary, change the block name.
2. Set the block mode to OOS by means of the **Block Mode/MODE_BLK** parameter, **TARGET** element.
3. Configure the level measurement → 86.
4. Set the block mode to **Auto** by means of the **Block Mode/MODE_BLK** parameter, **TARGET** element.

The block mode must be set to **Auto** for the measuring device to function correctly.

### 12.2.4 Configuring the Analog Input Blocks

The device has 2 permanently instanced Analog Input Blocks that can be assigned as required to the various process variables. If required, up to 5 Analog Input Blocks can be instanced through the FOUNDATION Fieldbus configuration tool.

| Default settings | |
|---|---|
| **Analog Input Block** | **CHANNEL** |
| AI 1 | 32949: Level linearized |
| AI 2 | 32856: Distance |

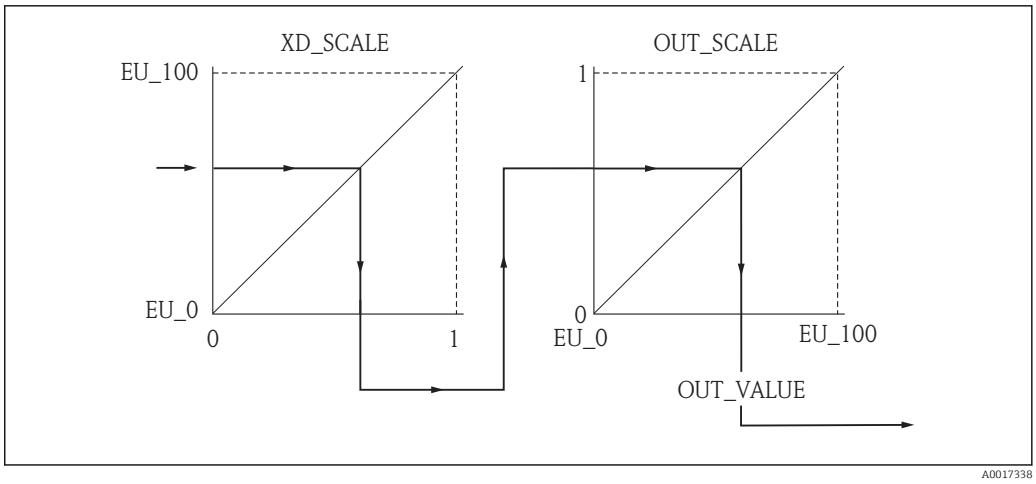
1. If necessary, change the block name.
2. Set the block mode to **OOS** by means of the **Block Mode/MODE_BLK** parameter, **TARGET** element.
3. Use the **Channel/CHANNEL** parameter to select the process variable which should be used as the input value for the Analog Input Block.
4. Use the **Transducer Scale/XD_SCALE** parameter to select the desired unit and the block input range for the process variable → 🖹 84. Make sure that the unit selected suits the process variable selected. If the process variable does not suit the unit, the **Block Error/BLOCK_ERR** parameter reports **Block Configuration Error** and the block mode cannot be set to **Auto**.
5. Use the **Linearization Type/L_TYPE** parameter to select the type of linearization for the input variable (factory setting: **Direct**). Make sure that the settings for the **Transducer Scale/XD_SCALE** and **Output Scale/ OUT_SCALE** parameters are the same for the **Direct** linearization type. If the values and units do not match, the **Block Error/BLOCK_ERR** parameter reports **Block Configuration Error** and the block mode cannot be set to **Auto**.
6. Enter the alarm and critical alarm messages by means of the **High High Limit/ HI_HI_LIM**, **High Limit/HI_LIM**, **Low Low Limit/LO_LO_LIM** and **Low Limit/ LO_LIM** parameters. The limit values entered must be within the value range specified for the **Output Scale/ OUT_SCALE** parameter → 🖹 84.
7. Specify the alarm priorities by means of the **High High Priority/HI_HI_PRI**, **High Priority/ HI_PRI**, **Low Low Priority/LO_LO_PRI** and **Low Priority/LO_PRI** parameters. Reporting to the field host system only takes place with alarms with a priority greater than 2.
8. Set the block mode to **Auto** using the **Block Mode/MODE_BLK** parameter, **TARGET** element. For this purpose, the Resource Block and the Setup Transducer Block must also be set to the **Auto** block mode.

### 12.2.5 Additional configuration

1. Link the function blocks and output blocks.
2. After specifying the active LAS, download all the data and parameters to the field device.

## 12.3 Scaling of the measured value in an AI Block

If the type of linearisation **L_TYPE** = **indirect** has been selected in an AI block, the measured value can be scaled within the block. The input range is defined by the **XD_SCALE** parameter through its **EU_0** and **EU_100** elements. This range is mapped linearly to the output ranged defined by the **OUT_SCALE** parameter through its **EU_0** and **EU_100** elements.




*26 Scaling of the measured value in an AI Block*

- If you have selected the **Direct** mode for the **L_TYPE** parameter, you cannot change the values and units for **XD_SCALE** and **OUT_SCALE**.
- The **L_TYPE**, **XD_SCALE** and **OUT_SCALE** parameters can only be changed in the OOS block mode.

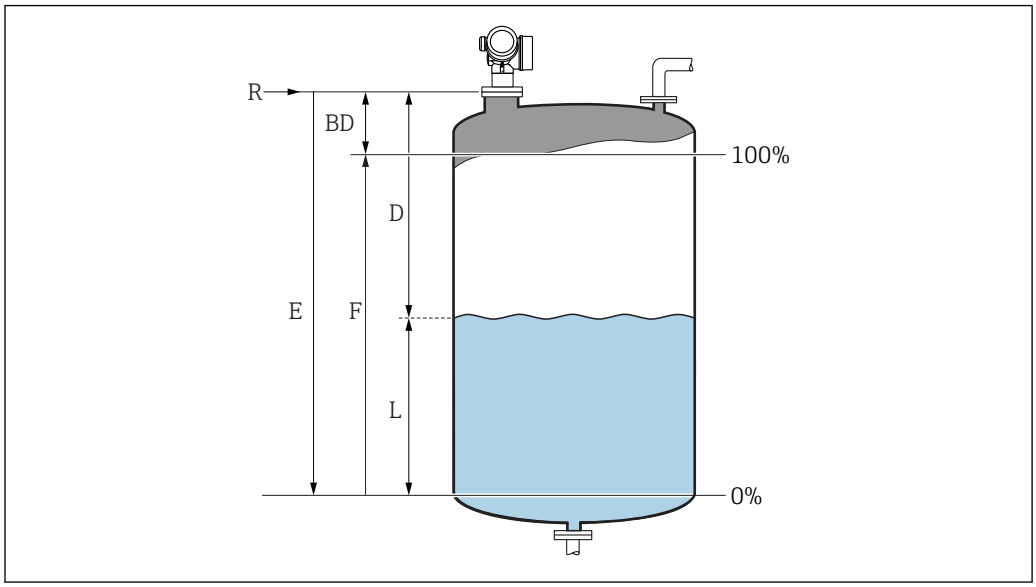
## 12.4 Language selection

| Step | Block | Parameter | Action |
|---|---|---|---|
| 1 | DISPLAY (TRDDISP) | Language (language) | Select language [1].<br>**Selection:**<br>▪ 1268: Swedish<br>▪ 32805: Arabian<br>▪ 32824: Chinese simplified<br>▪ 32842: Czech<br>▪ 32881: Dutch<br>▪ 32888: English<br>▪ 32917: French<br>▪ 32920: German<br>▪ 32945: Italian<br>▪ 32946: Japanese<br>▪ 32948: Korean<br>▪ 33026: Polish<br>▪ 33027: Portuguese<br>▪ 33062: Russian<br>▪ 33083: Spanish<br>▪ 33103: Thai<br>▪ 33120: Vietnamese<br>▪ 33155: Bahasa<br>▪ 33166: Turkish |

1) When ordering a device the set of available languages is defined. Refer to the product structure, feature 500 "Additional Operation Language".

## 12.5 Configuration of a level measurement

The **Setup** method can also be used to configure the measurement. It is called up via the SETUP (TRDSUP) Transducer Block.




*R = Reference point of the measurement* *E = Empty calibration (= Zero point)*
*D = Distance* *F = Full calibration (= span)*
*L = Level*

| Step | Block | Parameter | Action |
|---|---|---|---|
| 1 | SETUP (TRDSUP) | Distance unit (distance_unit) | Select distance unit.<br>**Selection:**<br>▪ 1010: m<br>▪ 1013: mm<br>▪ 1018: ft<br>▪ 1019: in |
| 2 | SETUP (TRDSUP) | Tank type (tank_type) | Select tank type.<br>**Selection:**<br>▪ 1271: Process vessel with agitator<br>▪ 1272: Process vessel standard<br>▪ 1273: Storage vessel<br>▪ 1274: Wave guide antenna<br>▪ 1279: Sphere<br>▪ 32816: Bypass / pipe<br>▪ 33013: Open channel<br>▪ 33094: Stilling well |
| 3 | SETUP (TRDSUP) | Tube diameter (tube_diameter) [1)] | Enter the diameter of the bypass or stilling well. |
| 4 | SETUP (TRDSUP) | Medium group (medium_group) | Select medium group.<br>**Selection:**<br>▪ 316: water based (DC>4)<br>▪ 256: other (DC≥ 1.9) |
| 5 | SETUP (TRDSUP) | Empty calibration (empty_calibration) | Enter the distance E between the reference point R and the minimum level (0%). |
| 6 | SETUP (TRDSUP) | Full calibration (full_calibration) | Enter distance F between the minimum (0%) and maximum (100%) level. |
| 7 | SETUP (TRDSUP) | Level (level) | Displays the measured level L. |

| Step | Block | Parameter | Action |
|---|---|---|---|
| 8 | SETUP (TRDSUP) | Distance (filtered_dist_val) | Displays the distance D between the reference point R and the level L. |
| 9 | SETUP (TRDSUP) | Signal quality (signal_quality) | Displays the signal quality of the level echo. |
| 10 | SETUP (TRDSUP) | Confirm distance (confirm_distance) | Compare the displayed distance to the real distance in order to start the recording of the mapping curve.<br>**Selection:**<br>▪ 179: Manual map<br>▪ 32847: Factory map<br>▪ 32859: Distance ok<br>▪ 32860: Distance too big<br>▪ 32861: Distance too small<br>▪ 32862: Distance unknown<br>▪ 33100: Tank empty |

1) only available for "Tank type" = "Bypass/pipe"

## 12.6 Configuration of the on-site display

### 12.6.1 Factory settings of the on-site display for level measurements

| Parameter | Factory setting |
|---|---|
| Format display | 1 value, max. size |
| Value 1 display | Level linearized |
| Value 2 display | None |
| Value 3 display | None |
| Value 4 display | None |

The on-site display can be adjusted in the **DISPLAY (TRDDISP)** transducer block.

## 12.7 Configuration management

After commissioning, you can save the current device configuration, copy it to another measuring point or restore the previous device configuration. You can do so using the **Configuration management** parameter and its options.

**Navigation path in the operating menu**
Setup → Advanced setup → Conf.backup disp → Config. managem.

**Block operation**
Block: **DISPLAY (TRDDISP)**
Parameter: **Configuration management (configuration_management)**

*Functions of the parameter options*

| Options | Description |
|---|---|
| 33097: Execute backup | A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy comprises the transmitter data of the device. |
| 33057: Restore | The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter data of the device. |

| Options | Description |
|---|---|
| 33838: Duplicate | The transmitter configuration from another device is duplicated to the device using the display module. |
| 265: Compare | The device configuration saved in the display module is compared to the current device configuration of the HistoROM. |
| 32848: Clear backup data | The backup copy of the device configuration is deleted from the display module of the device. |

*HistoROM*
A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

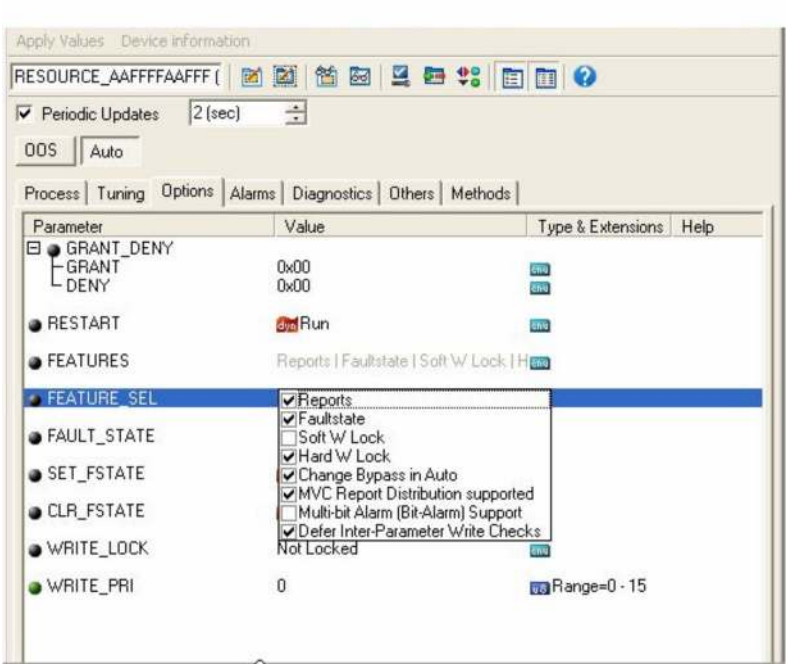
While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

## 12.8 Configuration of the event behavior according to the FOUNDATION Fieldbus specification FF912

The device complies with the FOUNDATION Fieldbus specification FF912. This has - among other things - the following consequences:

- The diagnsotic category according to NAMUR recommendation NE107 is transmitted via the fieldbus in a manufacturer-independent form:
  - F: Failure
  - C: Function check
  - S: Out of specification
  - M: Maintenance required
- The diagnostic category of pre-defined groups of events can be adjusted by the user according to the requirements of the specific application.
- Certain events can be separated from their group and can be handled individually:
  - 941: Echo lost
  - 942: In safety distance
  - 950: Advanced Diagnostic occurred
- Additional information and remedial measures are transmitted together with the event message via the fieldbus.

The diagnostic messages according to FF912 are available in the host only if the **Multi-bit support** option has been activated in the **FEATURE_SEL** parameter of the Resource block. For reasons of compatibility, this option is **not** activated on delivery:



### 12.8.1 Groups of events

The diagnostic messages are classified into 16 groups according to the **source** and **severity** of the respective event. A **default diagnostic category** is allocated to each group. Each group is also represented by one bit of the allocation parameters.

| Severity of the event | Default diagnostic category | Source of the event | Bit | Events within the group |
|---|---|---|---|---|
| Highest severity | Failure (F) | Sensor | 31 | ▪ F003: Broken probe detected<br>▪ F046: Build-up detected<br>▪ F083: Memory content<br>▪ F104: HF cable<br>▪ F105: HF cable<br>▪ F106: Sensor |
| | | Electronics | 30 | ▪ F242: Software incompatible<br>▪ F252: Modules incompatible<br>▪ F261: Electronic modules<br>▪ F262: Module connecting<br>▪ F270: Main electronic failure<br>▪ F271: Main electronic failure<br>▪ F272: Main electronic failure<br>▪ F273: Main electronic failure<br>▪ F275: I/O-Modul failure<br>▪ F276: I/O module failure<br>▪ F282: Data storage<br>▪ F283: Memory content<br>▪ F311: Electronic Failure |
| | | Configuration | 29 | ▪ F410: Data transfer<br>▪ F435: Linearization<br>▪ F437: Configuration incompatible<br>▪ F482: Block in OOS |
| | | Process | 28 | ▪ F803: Current loop 1<br>▪ F825: Current loop 1<br>▪ F936: EMC interference<br>▪ F941: Echo lost [1)]<br>▪ F970: Linearization |

1) This event can be removed from the group in order to define its behavior individually; see section "Configurable area".

| Severity of the event | Default diagnostic category | Source of the event | Bit | Events within the group |
|---|---|---|---|---|
| High severity | Function check (C) | Sensor | 27 | not used in Micropilot |
| | | Electronics | 26 | not used in Micropilot |
| | | Configuration | 25 | ▪ C411: Up-/download<br>▪ C484: Simulation failure mode<br>▪ C485: Simulation measured value<br>▪ C492: Simulation frequency output<br>▪ C493: Simulation pulse output<br>▪ C494: Switch output simulation<br>▪ C495: Simulation block output<br>▪ C585: Simulation distance<br>▪ C586: Record map |
| | | Process | 24 | not used in Micropilot |

| Severity of the event | Default diagnostic category | Source of the event | Bit | Events within the group |
|---|---|---|---|---|
| Low severity | Out of specification (S) | Sensor | 23 | not used in Micropilot |
| | | Electronics | 22 | not used in Micropilot |

| Severity of the event | Default diagnostic category | Source of the event | Bit | Events within the group |
|---|---|---|---|---|
| | | Configuration | 21 | ▪ S442: Frequency output<br>▪ S443: Pulse output |
| | | Process | 20 | ▪ S801: Energy too low<br>▪ S825: Operating temperature<br>▪ S921: Change of reference<br>▪ S942: In safety distance [1)]<br>▪ S943: In blocking distance<br>▪ S944: Level range<br>▪ S968: Level limited |

1) This event can be removed from the group in order to define its behavior individually; see section "Configurable area".

| Severity of the event | Default diagnostic category | Source of the event | Bit | Events within the group |
|---|---|---|---|---|
| Lowest severity | Maintenance required (M) | Sensor | 19 | not used in Micropilot |
| | | Elektronics | 18 | ▪ M272: Main electronics failure<br>▪ M311: Electronics failure |
| | | Configuration | 17 | M438: Data set |
| | | Process | 16 | M950: Advanced diagnostic occurred |

### 12.8.2 Allocation parameters

The allocation of event categories to the event groups is controlled by the allocation parameters. They reside in the **RESOURCE (RB2)** block:

- **FD_FAIL_MAP**: for the **Failure (F)** event category
- **FD_CHECK_MAP**: for the **Function check (C)** event category
- **FD_OFFSPEC_MAP**: for the **Out of specification (S)** event category
- **FD_MAINT_MAP**: for the **Maintenance required (M)** event category

Each allocation parameter consists of 32 bits with the following meaning:

- **Bit 0:** reserved by the Fieldbus Foundation
- **Bits 1 to 15:** Configurable area; here, a number of predefined diagnostic events can be allocated irrespective of the group of events they belong to. In this case they are removed from their group and their bahavior can be configured individually. With Micropilot, the following parameters can be allocated to the configurable area:
  - 941: Echo lost
  - 942: In safety distance
  - 950: Advanced Diagnostic occurred
- **Bits 16 ... 31:** Standard area; these bits are permanently allocated to a specific group of events. If a bit is set to **1**, the respective event category is assigned to the group.

The following table represents the default setting of the allocation parameters. In the default setting there is a unique relationship between the severity of the event and its category (i.e. its allocation parameter).

*Default setting of the allocation parameters*

| | Standard area | | | | | | | | | | | | | | | | Configurable area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Severity of the event** | **Highest severity** | | | | **High severity** | | | | **Low severity** | | | | **Lowest severity** | | | | |
| **Source of the event** [1] | S | E | C | P | S | E | C | P | S | E | C | P | S | E | C | P | |
| **Bit** | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 ... 1 |
| **FD_FAIL_MAP** | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **FD_CHECK_MAP** | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **FD_OFFSPEC_MAP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| **FD_MAINT_MAP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |

1) S: Sensor; E: Electronics; C: Configuration; P: Process

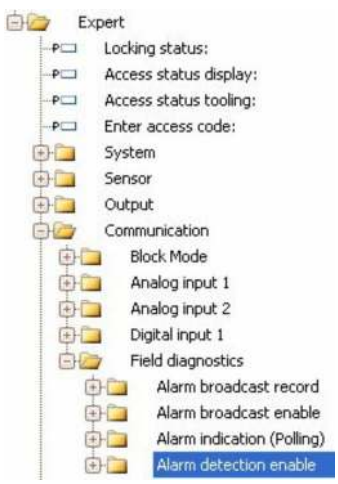
In order to change the diagnostic behavior of a group of events, proceed as follows:

1. Open the allocation parameter to which the group is currently allocated.
2. Switch the bit of the group from **1** to **0**. In the case of operation via FieldCare this is done by deactivating the respective checkbox (see the example below).
3. Open the allocation to which the group is to be allocated.
4. Switch the bit of the group from **0** to**1**. In the case of operation via FieldCare this is done by activating the respective checkbox (see the example below).

**Example**

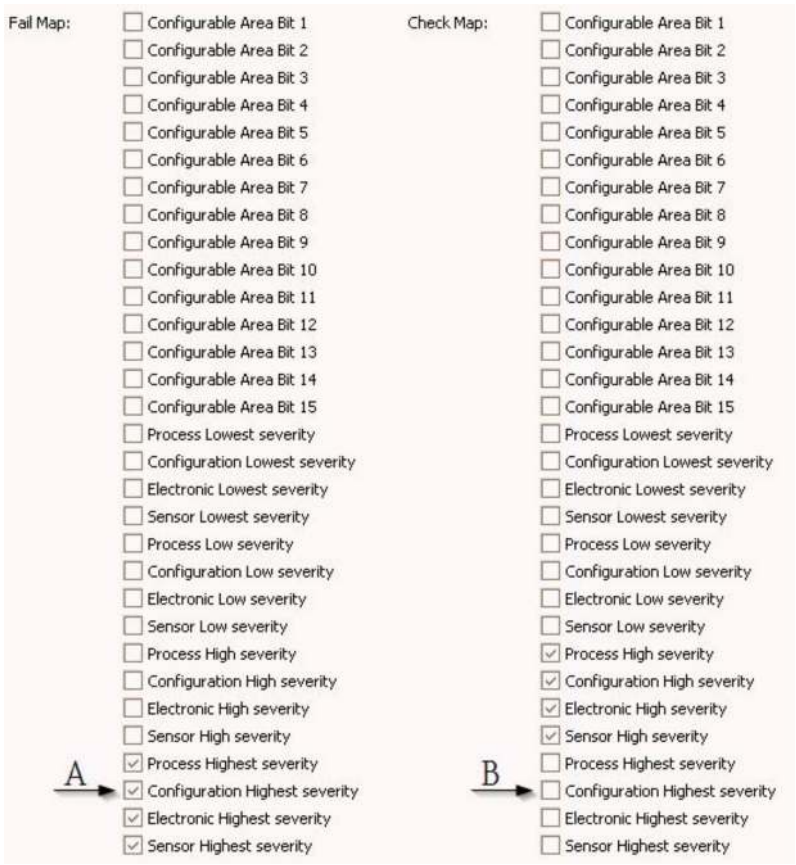
The **Highest severity / Configuration** group contains the messages **410: Data transfer**, **411: Up-/Download**, **435: Linearization** and **437: Configuration incompatible**. These messages are no longer to be classified as **Failure (F)** but as **Funcktion check (C)**.

1.




Use the FieldCare navigation window to navigate to the the following screen: **Expert → Communication → Field diagnostics → Alarm detection enable**.

2.




27 *Default state of the "Fail Map" and "Check Map" columns*

Look for the **Configuration Highest Severity** group in the **Fail Map** column and deactivate the associated checkbox (A). Activate the respective checkbox in the **Check Map** column (B). Remember to confirm each change by pressing the Enter key.




28 *Changed state of the "Fail Map" and "Check Map" columns*

Make sure that for each group the corresponding bit is set to **1** in at least one of the allocation parameters. Otherwise no event category is transmitted with the event message. As a consequence the message will not be recognized by the control system.

The **Alarm detection enable** screen is used to configure the detection of diagnostic events but not the transmission of event messages to the bus. The latter is configured on the **Alarm broadcast enable** screen, which is operated exactly in the same way as the **Alarm detection enable** screen. Status information is only transmitted to the bus if the Resource Block is in the **Auto** mode.

### 12.8.3 Configurable area

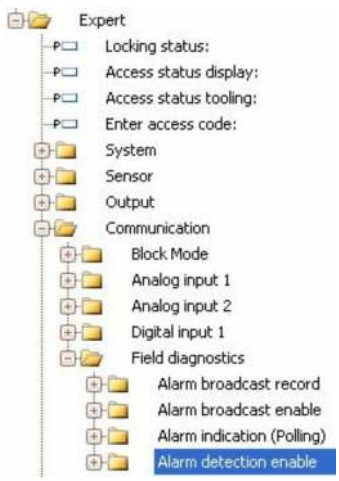
An event category can be individually defined for the following parameters - irrespective of the group of events they belong to by default.

- **F941**: Echo lost
- **S942:** In safety distance
- **M950:** Advanced Diagnostic occurred

Prior to changing the event category, the event must be allocated to one of the bits 1 to 15. This is performed by the parameters **FF912 ConfigArea_1** to **FF912ConfigArea_15** in the **DIAGNOSTIC (TRDDIAG)** block. Thereafter, the selected bit can be switched from **0** to **1** in the desired allocation parameter.

#### Example

To change the category of error **942 "In safety distance"** from **Out of specification (S)** (default), to **Function check (C)**, proceed as follows.

1. 


   Use the FieldCare navigation window to navigate to the the following screen: **Expert → Communication → Field diagnostics → Alarm detection enable**.

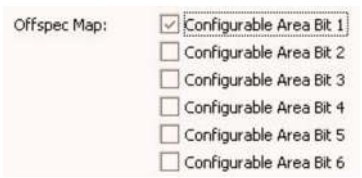
2. 


   By default all **Configurable Area Bits** are set to **not used**.

3. 


   Select one of these bits (in the example: Configurable Area Bit 1) and select **In safety distance** from the associated drop-down menu. Confirm the selection by pressing the Enter key.

4.



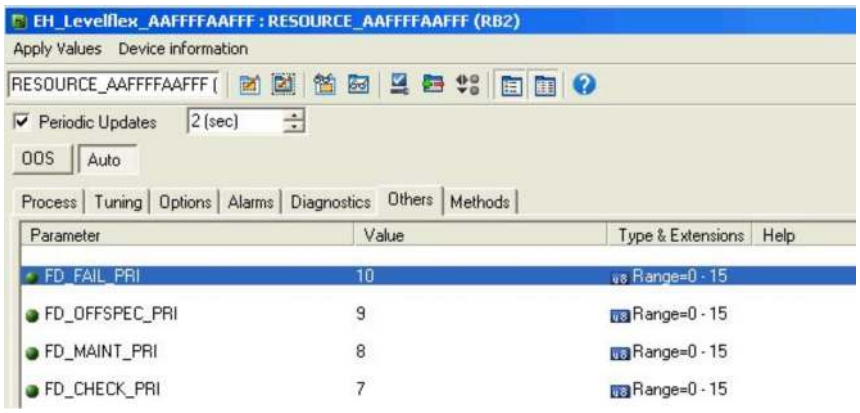

Got to the **Offspec Map** column and activate the checkbox of the respective bit (in the example: **Configurable Area Bit 1**). Confirm the selection by pressing the Enter key.

A change of the error category of **In safety distance** does not affect an error which is already present. The new category is only assigned if a new error of this type occurs after the change.

### 12.8.4 Transmission of the event meassages to the bus

#### Event priority

Event messages are only transmitted to the bus if their priority is between 2 and 15. Events of priority 1 are indicated on the display but not transmitted to the bus. Events of priority 0 are ignored. By default, the priority is 0 for all events. The priority can be adjusted individually for each allocation parameter. This is done by the following four priority parameters:




#### Suppression of individual events

For individual events, the transmission to the bus can suppressed by the use of a mask. The corresponding events will be displayed but not transmitted to the bus. In FieldCare, this mask can be found at **Expert → Communication → Field diagnostics → Alarm broadcast enable**. This mask functions as a negative mask, which means that, if a field is marked, the corresponding events will **not** be transmitted to the bus.

## 12.9 Protection of the settings against unauthorized changes

There are two ways to protect the settings against unauthorized changes:

- Via locking switch (hardware locking) → 📄 51
- Via operating menu (software locking) → 📄 50
- Via block operation:
  - Block: **DISPLAY (TRDDISP)**; parameter: **Define access code (define_access_code)**
  - Block: **EXPERT_CONFIG (TRDEXP)**; parameter: **Enter access code (enter_access_code)**

# 13 Diagnostics and troubleshooting

## 13.1 General trouble shooting

### 13.1.1 General errors

| Error | Possible cause | Remedial action |
|---|---|---|
| Device does not respond. | Supply voltage not connected. | Connect the correct voltage. |
| | The cables do not contact the terminals properly. | Ensure electrical contact between the cable and the terminal. |
| Values on the display invisible | Contrast setting is too weak or too strong. | ▪ Increase contrast by pressing ⊞ and Ⓔ simultaneously.<br>▪ Decrease contrast by pressing ⊟ and Ⓔsimultaneously. |
| | The plug of the display cable is not connected correctly. | Connect the plut correctly. |
| | Display is defective. | Replace display. |
| "Communication error" is indicated on the display when starting the device or connecting the display | Electromagnetic interference | Check grounding of the device. |
| | Broken display cable or display plug. | Exchange display. |
| Duplicating of the parameters from one device to another via the display doesn't work.<br>Only the "Save" and "Abort" options are available. | Display with backup is not recognized if no data backup has been performed at the device before. | Connect display (with the backup) and restart the device. |
| CDI communication does not work. | Wrong setting of the COM port on the computer. | Check the setting of the COM port on the computer and change it if necessary. |
| Device measures incorrectly. | Parametrization error | Check and adjust parameterization. |

### 13.1.2 Parametrization errors

| Error | Possible cause | Remdy |
|---|---|---|
| Measured value incorrect | If measured distance (Setup → Distance) matches the real distance:<br>Calibration error | ▪ Check and adjust **Empty calibration** parameter (→ 🖹 132) if necessary.<br>▪ Check and adjust **Full calibration** parameter (→ 🖹 133) if necessary.<br>▪ Check and adjust linearization if necessary (**Linearization** submenu (→ 🖹 150)). |
| | For measurements in bypasses / stilling well:<br>▪ Wrong tank type<br>▪ Wrong tube diameter | ▪ Select **Tank type (→ 🖹 131)** = **Bypass / pipe**.<br>▪ Enter correct diamter in **Tube diameter** parameter (→ 🖹 132). |
| | Wrong level correction | Enter correct value in **Level correction** parameter (→ 🖹 147). |
| | If measured distance (Setup → Distance) does not match the real distance:<br>Interference echo | Carry out tank mapping (**Confirm distance** parameter (→ 🖹 135)). |

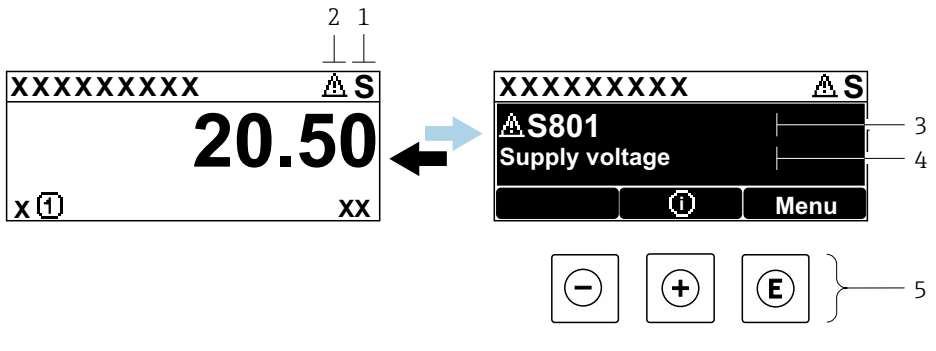
| Error | Possible cause | Remdy |
|---|---|---|
| No change of measured value on filling / emptying | Interference echo from installations, nozzle or build-up on the antenna. | ▪ Carry out tank mapping (**Confirm distance** parameter (→ 🖹 135)).<br>▪ If necessary, clean antenna<br>▪ If necessary, selet better mopunting position |
| If the surface is not calm (e.g. filling, emptying, agitator running), the measured value jumps sporadically to a higher level | Signal is weakened by the rough surface - the interference echoes are sometimes stronger. | ▪ Carry out tank mapping (**Confirm distance** parameter (→ 🖹 135)).<br>▪ Select **Tank type (→ 🖹 131)** = **Process vessel with agitator**.<br>▪ Increase integration time (Expert → Sensor → Distance → Integration time)<br>▪ Optimize orientation of the antenna<br>▪ If necessary, select a better mounting position and/or larger antenna. |
| During filling/emptying the measxured value jumps downwards | Multiple echoes | ▪ Check **Tank type** parameter (→ 🖹 131).<br>▪ If possible, do not select central installation position.<br>▪ If appropriate, use a stilling well. |
| Error message F941 or S941 "Echo lost" | Level echo is too weak. | ▪ Check **Medium group** parameter (→ 🖹 132).<br>▪ If necessary, select a more detailed setting in **Medium property** parameter (→ 🖹 143).<br>▪ Optimize alignment of antenna<br>▪ If necessary, select a better installation position and/or larger antenna. |
| | Level echo suppressed. | Delete mapping and record it again. |
| Device displays a level when the tank is empty. | Interference echo | Carry out mapping over entire measuring range when the tank is empty (**Confirm distance** parameter (→ 🖹 135)). |
| Wrong slope of the level in the entire measuring range | Wrong tank type selected. | Set **Tank type** parameter (→ 🖹 131) correctly. |

## 13.2 Diagnostic information on local display

### 13.2.1 Diagnostic message

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the measured value display.

| Measured value display in alarm condition | Diagnostic message |
|---|---|




1 *Status signal*
2 *Status symbol (symbol for event level))*
3 *Status symbol with diagnostics event*
4 *Event text*
5 *Operating elements*

#### Status signals

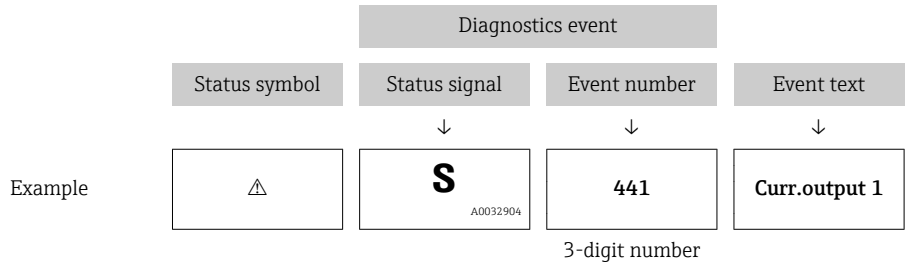
| | |
|---|---|
| F A0032902 | **"Failure (F)" option**<br>A device error is present. The measured value is no longer valid. |
| C A0032903 | **"Function check (C)" option**<br>The device is in service mode (e.g. during a simulation). |
| S A0032904 | **"Out of specification (S)" option**<br>The device is operated:<br>▪ Outside of its technical specifications (e.g. during startup or a cleaning)<br>▪ Outside of the configuration carried out by the user (e.g. level outside configured span) |
| M A0032905 | **"Maintenance required (M)" option**<br>Maintenance is required. The measured value is still valid. |

#### Status symbol (symbol for event level)

| | |
|---|---|
| ⊗ | **"Alarm" status**<br>The measurement is interrupted. The signal outputs take on the defined alarm condition. A diagnostic message is generated. |
| ⚠ | **"Warning" status**<br>The device continues to measure. A diagnostic message is generated. |

### Diagnostics event and event text

The fault can be identified using the diagnostics event. The event text helps you by providing information about the fault. In addition, the corresponding symbol is displayed before the diagnostics event.



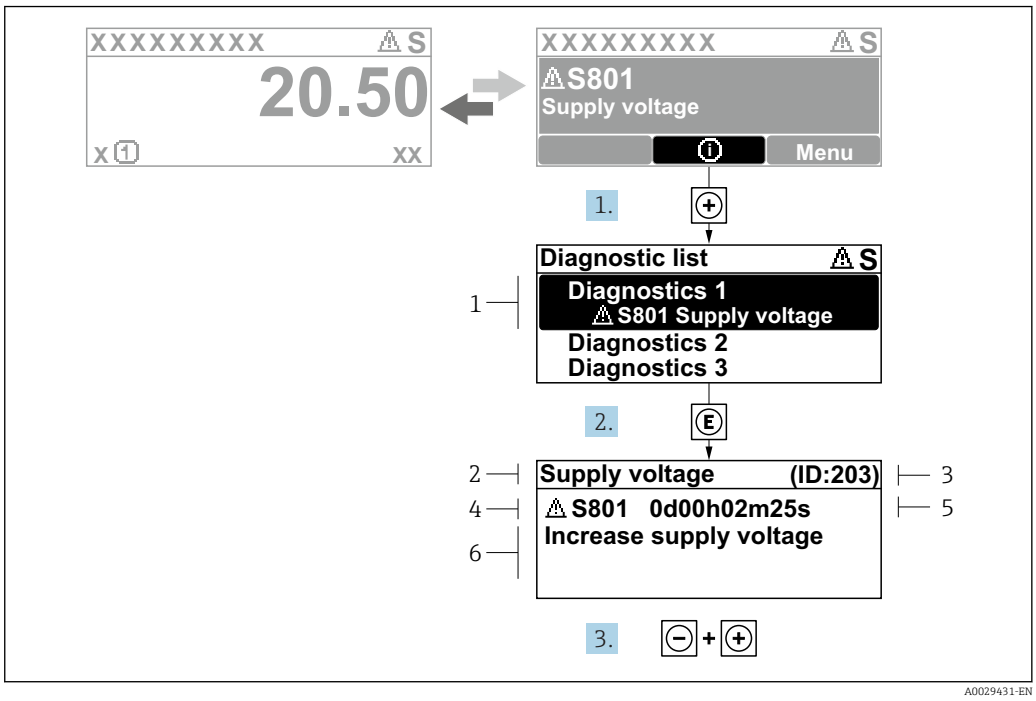

If two or more diagnostic messages are pending simultaneously, only the message with the highest priority is shown. Additional pending diagnostic messages can be shown in the **Diagnostic list** submenu.

Past diagnostic messages that are no longer pending are shown as follows:
- On the local display:
  in the **Event logbook** submenu
- In FieldCare:
  via the "Event List /HistoROM" function.

### Operating elements

| Operating functions in menu, submenu | |
|---|---|
| ⊞ | **Plus key**<br>Opens the message about the remedial measures. |
| Ⓔ | **Enter key**<br>Opens the operating menu. |

### 13.2.2 Calling up remedial measures




29 *Message for remedial measures*

1 *Diagnostic information*
2 *Short text*
3 *Service ID*
4 *Diagnostic behavior with diagnostic code*
5 *Operation time of occurrence*
6 *Remedial measures*

The user is in the diagnostic message.

1. Press ⊞ (ⓘ-Symbol).
   ↳ **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with ⊞ or ⊟ and press Ⓔ.
   ↳ The message for the remedial measures for the selected diagnostic event opens.
3. Press ⊟ + ⊞ simultaneously.
   ↳ The message for the remedial measures closes.

The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in **Diagnostic list** submenu or in **Previous diagnostics**.

1. Press Ⓔ.
   ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press ⊟ + ⊞ simultaneously.
   ↳ The message for the remedial measures closes.

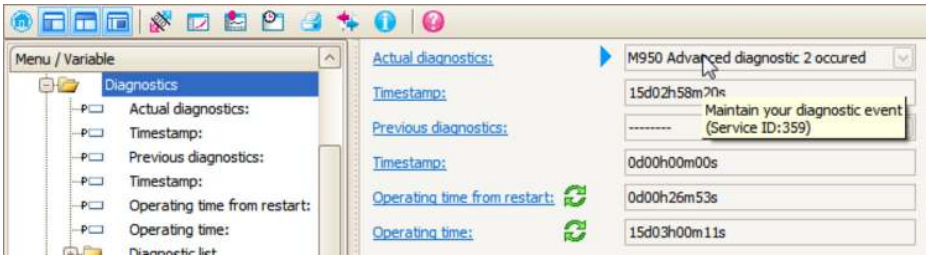
## 13.3 Diagnostic event in the operating tool

If a diagnostic event is present in the device, the status signal appears in the top left status in the operating tool along with the corresponding symbol for event level in accordance with NAMUR NE 107:

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)

### A: Via the operating menu

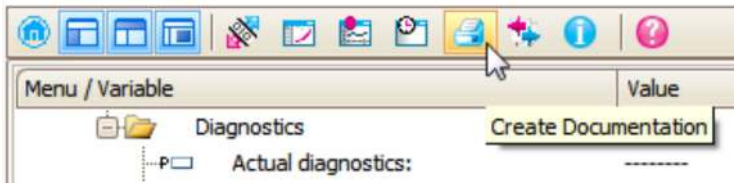
1. Navigate to the **Diagnostics** menu.
   ↳ In the **Actual diagnostics** parameter, the diagnostic event is shown with event text.
2. On the right in the display range, hover the cursor over the **Actual diagnostics** parameter.
   ↳




A tool tip with remedial measures for the diagnostic event appears.

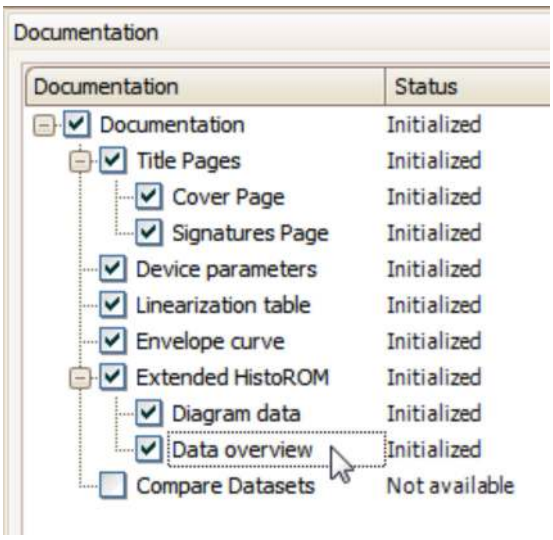
### B: Via the "Create documentation" function

1.




Select the "Create documentation" function.

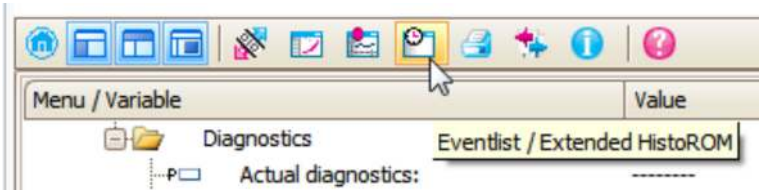
2.




Make sure "Data overview" is marked.

3. Click "Save as ..." and save a PDF of the protocol.
   ↳ The protocol contains the diagnostic messages and remedy information.

**C: Via the "Eventlist / Extended HistoROM" function**

1. 


   Select the "Eventlist / Extended HistoROM" function.

2. 


   Select the "Load Eventlist" function.
   ↳ The list of events, including remedy information, is shown in the "Data overview" window.

## 13.4 Diagnostic messages in the DIAGNOSTIC Transducer Block (TRDDIAG)

- The **Actual diagnostics** parameter displays the message with the highest priority. Every message is also output as per the FOUNDATION Fieldbus Specification by means of the **XD_ERROR** and **BLOCK_ERROR** parameters.
- A list of diagnostic messages is displayed in the **Diagnostics 1** to **Diagnostics 5** parameters. If more than 5 messages are currently active, only those with the highest priority are displayed.
- You can view a list of alarms which are no longer active (event log) via the **Previous diagnostics** parameter.

## 13.5 Diagnostic list

In the **Diagnostic list** submenu submenu, up to 5 currently pending diagnostic messages can be displayed. If more than 5 messages are pending, the messages with the highest priority are shown on the display.

**Navigation path**
Diagnostics → Diagnostic list

**Calling up and closing the remedial measures**

1. Press E.
   ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press − + + simultaneously.
   ↳ The message about the remedial measures closes.

## 13.6 Overview of diagnostic events

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|---|---|---|---|---|
| **Diagnostic of electronic** | | | | |
| 242 | Software incompatible | 1. Check software<br>2. Flash or change main electronics module | F | Alarm |
| 252 | Modules incompatible | 1. Check electronic modules<br>2. Change I/O or main electronic module | F | Alarm |
| 261 | Electronic modules | 1. Restart device<br>2. Check electronic modules<br>3. Change I/O Modul or main electronics | F | Alarm |
| 262 | Module connection | 1. Check module connections<br>2. Change electronic modules | F | Alarm |
| 270 | Main electronic failure | Change main electronic module | F | Alarm |
| 271 | Main electronic failure | 1. Restart device<br>2. Change main electronic module | F | Alarm |
| 272 | Main electronic failure | 1. Restart device<br>2. Contact service | F | Alarm |
| 273 | Main electronic failure | 1. Emergency operation via display<br>2. Change main electronics | F | Alarm |
| 275 | I/O module failure | Change I/O module | F | Alarm |
| 276 | I/O module failure | 1. Restart device<br>2. Change I/O module | F | Alarm |
| 282 | Data storage | 1. Restart device<br>2. Contact service | F | Alarm |
| 283 | Memory content | 1. Transfer data or reset device<br>2. Contact service | F | Alarm |
| 311 | Electronic failure | 1. Transfer data or reset device<br>2. Contact service | F | Alarm |
| 311 | Electronic failure | Maintenance required!<br>1. Do not perform reset<br>2. Contact service | M | Warning |
| **Diagnostic of configuration** | | | | |
| 410 | Data transfer | 1. Check connection<br>2. Retry data transfer | F | Alarm |
| 411 | Up-/download active | Up-/download active, please wait | C | Warning |
| 412 | Processing Download | Download active, please wait | C | Warning |
| 435 | Linearization | Check linearization table | F | Alarm |
| 437 | Configuration incompatible | 1. Restart device<br>2. Contact service | F | Alarm |
| 438 | Dataset | 1. Check data set file<br>2. Check device configuration<br>3. Up- and download new configuration | M | Warning |
| 482 | Block in OOS | Set Block in AUTO mode | F | Alarm |
| 484 | Simulation failure mode | Deactivate simulation | C | Alarm |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|---|---|---|---|---|
| 485 | Simulation measured value | Deactivate simulation | C | Warning |
| 494 | Switch output simulation | Deactivate simulation switch output | C | Warning |
| 495 | Simulation diagnostic event | Deactivate simulation | C | Warning |
| 497 | Simulation block output | Deactivate simulation | C | Warning |
| 585 | Simulation distance | Deactivate simulation | C | Warning |
| 586 | Record map | Recording of mapping<br>please wait | C | Warning |
| **Diagnostic of process** | | | | |
| 801 | Energy too low | Increase supply voltage | S | Warning |
| 825 | Operating temperature | 1. Check ambient temperature<br>2. Check process temperature | F | Alarm |
| 921 | Change of reference | 1. Check reference configuration<br>2. Check pressure<br>3. Check sensor | S | Warning |
| 941 | Echo lost | Check parameter 'DC value' | F | Alarm [1] |
| 942 | In safety distance | 1. Check level<br>2. Check safety distance<br>3. Reset self holding | S | Alarm [1] |
| 943 | In blocking distance | Reduced accuracy<br>Check level | S | Warning |
| 950 | Advanced diagnostic 1 to 2 occured | Maintain your diagnostic event | M | Warning [1] |

1) Diagnostic behavior can be changed.

# 13.7 Event logbook

## 13.7.1 Event history

A chronological overview of the event messages that have occurred is provided in the **Event list** submenu [6].

**Navigation path**
Diagnostics → Event logbook → Event list

A maximum of 100 event messages can be displayed in chronological order.

Die Ereignishistorie umfasst Einträge zu:
- Diagnostic events
- Information events

6) This submenu is only available for operation via local display. In the case of operation via FieldCare, the event list can be displayed with the "Event List / HistoROM" functionality of FieldCare.

In addition to the operation time of its occurrence, each event is also assigned a symbol that indicates whether the event has occurred or is ended:
- Diagnostic event
  - : Event has occurred
  - : Event has ended
- Information event
  : Event has occurred

**Calling up and closing the remedial measures**

1. Press E
   ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press − + + simultaneously.
   ↳ The message about the remedial measures closes.

## 13.7.2 Filtering the event logbook

Using the **Filter options** parameter, you can define which category of event messages is displayed in the **Event list** submenu.

**Navigation path**
Diagnostics → Event logbook → Filter options

**Filter categories**
- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information

## 13.7.3 Overview of information events

| Info number | Info name |
|---|---|
| I1000 | --------(Device ok) |
| I1089 | Power on |
| I1090 | Configuration reset |
| I1091 | Configuration changed |
| I1092 | Trend data deleted |
| I1110 | Write protection switch changed |
| I1137 | Electronic changed |
| I1151 | History reset |
| I1154 | Reset terminal voltage min/max |
| I1155 | Reset electronic temperature |
| I1156 | Memory error trend |
| I1157 | Memory error event list |
| I1185 | Display backup done |
| I1186 | Restore via display done |
| I1187 | Settings downloaded with display |
| I1188 | Display data cleared |
| I1189 | Backup compared |

| Info number | Info name |
|---|---|
| I1256 | Display: access status changed |
| I1264 | Safety sequence aborted |
| I1335 | Firmware changed |
| I1397 | Fieldbus: access status changed |
| I1398 | CDI: access status changed |
| I1512 | Download started |
| I1513 | Download finished |
| I1514 | Upload started |
| I1515 | Upload finished |

## 13.8 Firmware history

| Date | Firmware version | Modifications | Documentation (FMR50, FOUNDATION Fieldbus) | | |
|---|---|---|---|---|---|
| | | | Operating Instructions | Description of Parameters | Technical Information |
| 06.2012 | 01.00.zz | Original software | BA01120F/00/EN/01.13 | GP01017F/00/EN/01.13 | TI01039F/00/EN/03.13 |
| 05.2015 | 01.01.zz | ▪ additional languages<br>▪ HistoROM functionality enhanced<br>▪ Improvements and bugfixes | BA01120F/00/EN/02.15<br>BA01120F/00/EN/03.16 [1)] | GP01017F/00/EN/02.15 | TI01039F/00/EN/05.15<br>TI01039F/00/EN/07.16 [1)] |

1) Contains information on the Heartbeat wizards which are available in the latest DTM version for DeviceCare and FieldCare.

The firmware version can explicitly be ordered via the product structure. In this way it is possible to ensure compatibility of the firmware version with an existing or planned system integration.

# 14 Maintenance

The measuring device requires no special maintenance.

## 14.1 Exterior cleaning

When exterior-cleaning the device, always use cleaning agents that do not attack the surface of the hosuing and the seals.

## 14.2 Replacing seals

The process seals of the sensors (at the process connection) must be replaced periodically, particularly if molded seals (aseptic construction) are used. The period between changes depends on the frequency of cleaning cycles and on the temperature of the measured substance and the cleaning temperature.

# 15 Repairs

## 15.1 General information on repairs

### 15.1.1 Repair concept

The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser service or specially trained customers.

Spare parts are contained in suitable kits. They contain the related replacement instructions.

For more information on service and spare parts, contact the Service Department at Endress+Hauser.

### 15.1.2 Repairs to Ex-approved devices

When carrying out repairs to Ex-approved devices, please note the following:

- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, please note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, carry out the specified routine test on the device.
- Only Endress+Hauser Service may convert a certified device into a different certified variant.
- Document all repair work and conversions.

### 15.1.3 Replacement of an electronics module

If an electronics module has been replaced, it is not necessary to perform a new basic setup as the calibration parameters are stored in the HistoROM which is located in the housing. However, after exchanging the main electronics module it may be necessary to record a new mapping (interference echo suppression).

### 15.1.4 Replacement of a device

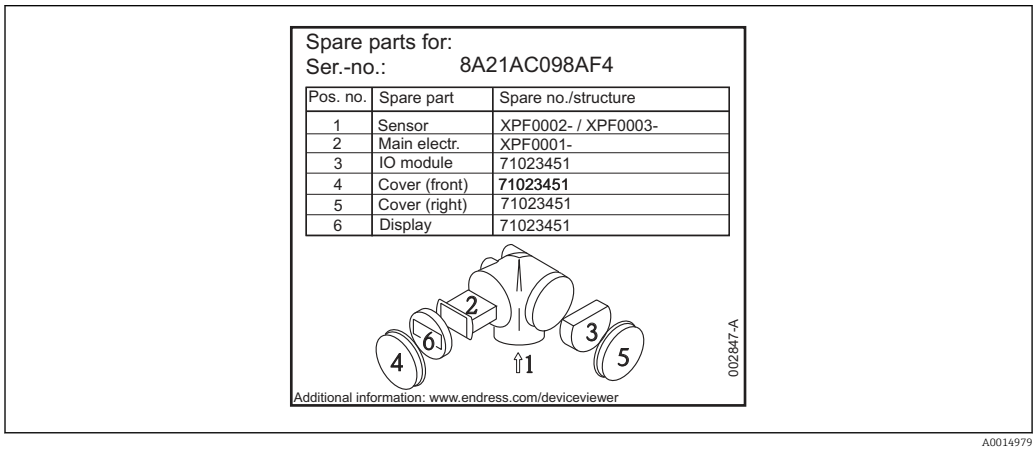
After a complete device or electronic module has been replaced, the parameters can be downloaded into the instrument again in one of the following ways:

- Via the display module
  Condition: The configuration of the old device has been saved in the display module → 174.
- Via FieldCare
  Condition: The configuration of the old device has been saved to the computer via FieldCare.

You can continue to measure without carrying out a new setup. Only a linearization and a tank map (interference echo suppression) have to be recorded again.

## 15.2 Spare parts

- A few interchangeable measuring device components are identified by a spare part nameplate. This contains information about the spare part.
- The connection compartment cover of the device contains a spare part nameplate that includes the following information:
  - A list of the most important spare parts for the measuring device, including their ordering information.
  - The URL for the *W@M Device Viewer* (www.endress.com/deviceviewer): There, all spare parts for the measuring device are listed, including the order code, and can be ordered. If available, the corresponding Installation Instructions can also be downloaded there.




*30 Example for spare part nameplate in connection compartment cover*

Measuring device serial number:
- Is located on the device and spare part nameplate.
- Can be read out via the "Serial number" parameter in the "Device information" submenu.

## 15.3 Return

The measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at http://www.endress.com/support/return-material

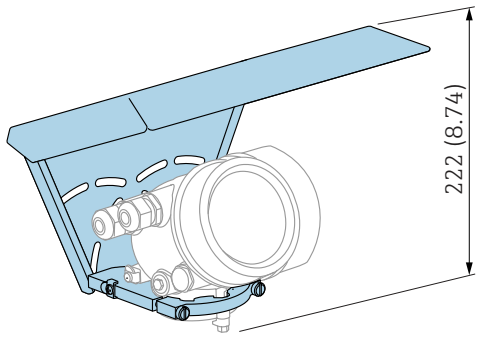
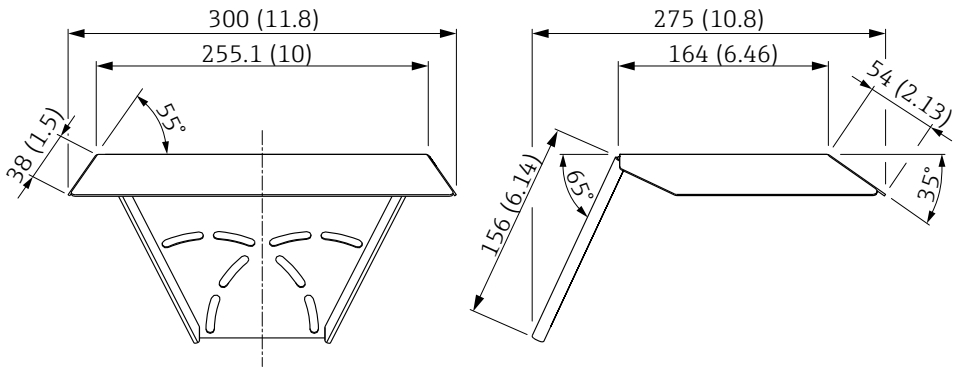
## 15.4 Disposal

Observe the following notes during disposal:
- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

# 16 Accessories

## 16.1 Device-specific accessories

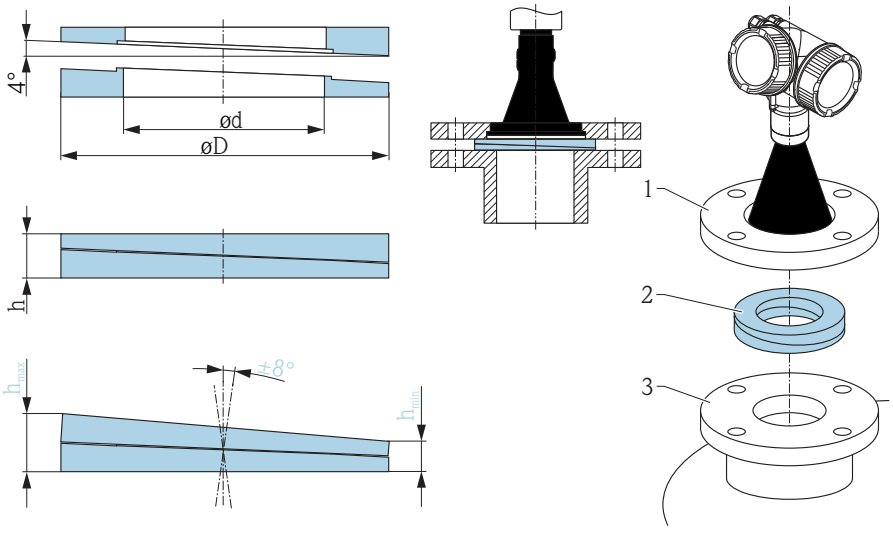
### 16.1.1 Weather protection cover

| Accessory | Description |
|---|---|
| Weather protection cover |  A0015466  A0015472 *31 Weather protection cover; Dimensions: mm (in)* The weather protection cover can be ordered together with the device (product structure, feature 620 "Accessory Enclosed", option PB "Weather Protection Cover"). Alternatively, it can be separately ordered as an accessory; order code 71162242. |

### 16.1.2 Mounting nut G1-1/2

| Accessory | Description |
|---|---|
| Mounting nut G1-1/2 | Drawing in preparation<br>For FMR50 with with 40mm/1-1/2" horn antenna and G1-1/2" thread<br>Material: PC<br>Order code: 52014146 |

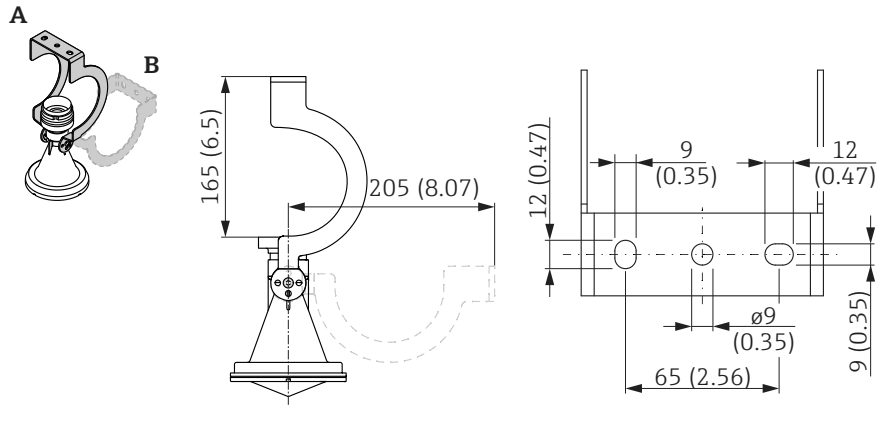
## 16.1.3 Variable flange seal for FMR50/FMR56

| Accessory | Description |
|---|---|
| Variable flange seal for FMR50/FMR56 | <br>A0018871<br>*1 UNI slip-on flange*<br>*2 Variable flange seal*<br>*3 Nozzle*<br>The material and process conditions of the adjustable flange seal must fit the process properties (temperature, pressure, resistance). |

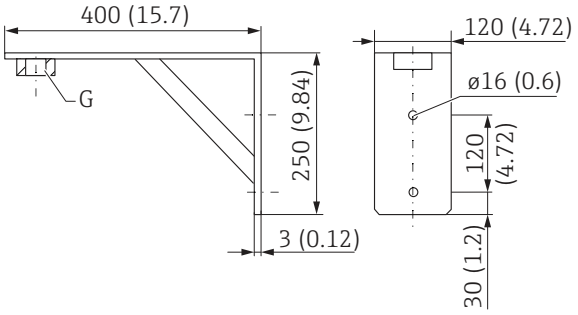
| Technical data: DN/JIS version | | | |
|---|---|---|---|
| Order code | 71074263 | 71074264 | 71074265 |
| Compatible with | DN80 PN10/40 | DN100 PN10/16 | ▪ DN150 PN10/16<br>▪ JIS 10K 150A |
| Length of screws | 100 mm (3.9 in) | 100 mm (3.9 in) | 110 mm (4.3 in) |
| Size of screws | M14 | M14 | M18 |
| Material | EPDM | | |
| Process pressure | −0.1 to 0.1 bar (−1.45 to 1.45 psi) | | |
| Process temperature | −40 to +80 °C (−40 to +176 °F) | | |
| D | 142 mm (5.59 in) | 162 mm (6.38 in) | 218 mm (8.58 in) |
| d | 89 mm (3.5 in) | 115 mm (4.53 in) | 169 mm (6.65 in) |
| h | 22 mm (0.87 in) | 23.5 mm (0.93 in) | 26.5 mm (1.04 in) |
| $h_{min}$ | 14 mm (0.55 in) | 14 mm (0.55 in) | 14 mm (0.55 in) |
| $h_{max}$ | 30 mm (1.18 in) | 33 mm (1.3 in) | 39 mm (1.45 in) |

| Accessory | Description | | | |
|---|---|---|---|---|
| | **Technical data: ASME/JIS version** | | | |
| | Order code | 71249070 | 71249072 | 71249073 |
| | Compatible with | ▪ ASME 3" 150lbs<br>▪ JIS 80A 10K | ASME 4" 150lbs | ASME 6" 150lbs |
| | Length of screws | 100 mm (3.9 in) | 100 mm (3.9 in) | 110 mm (4.3 in) |
| | Recommended screw size | M14 | M14 | M18 |
| | Material | EPDM | | |
| | Process pressure | −0.1 to 0.1 bar (−1.45 to 1.45 psi) | | |
| | Process temperature | −40 to +80 °C (−40 to +176 °F) | | |
| | D | 133 mm (5.2 in) | 171 mm (6.7 in) | 219 mm (8.6 in) |
| | d | 89 mm (3.5 in) | 115 mm (4.53 in) | 168 mm (6.6 in) |
| | h | 22 mm (0.87 in) | 23.5 mm (0.93 in) | 26.5 mm (1.04 in) |
| | $h_{min}$ | 14 mm (0.55 in) | 14 mm (0.55 in) | 14 mm (0.55 in) |
| | $h_{max}$ | 30 mm (1.18 in) | 33 mm (1.3 in) | 39 mm (1.45 in) |

### 16.1.4 Mounting bracket for wall or ceiling mounting of FMR50/ FMR56

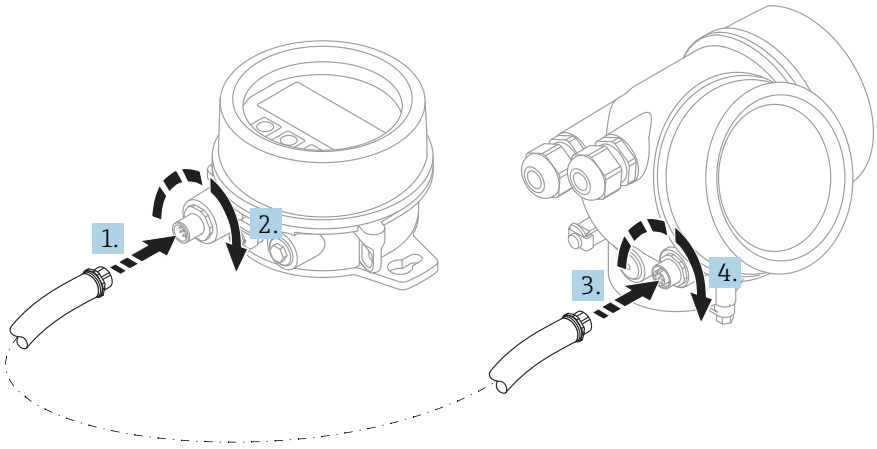
| Accessory | Description |
|---|---|
| Mounting bracket for wall or ceiling mounting of FMR50/FMR56 | <br>*32 Mounting bracket for FMR50/FMR56 with horn antenna*<br>*A Mounting at ceiling*<br>*B Mounting at wall*<br>▪ **Material:**<br>– Mounting bracket: 304 (1.4301)<br>– Screws: A2<br>– Nordlock washer: A4<br>▪ **Order code:** 71162776 |

### 16.1.5 Installation bracket for FMR50

| Accessory | Description |
|---|---|
| Installation bracket for FMR50 | <br>A0019346<br>▪ **Material:** 316Ti (1.4571)<br>▪ **Suited for antenna version** [1]:<br>BM: Horn 40mm (1½"), PVDF encapsulated, -40...130°C (-40...266°F)<br>▪ **Suited for process connection** [2]:<br>– GGF: Thread ISO228 G1½, PVDF<br>– RGF: Thread ANSI MNPT1½, PVDF<br>▪ **Order code:** 942669-0000<br>The mounting bracket has no conductive connection to the transmitter housing.<br>Danger of electrostatic charging.<br>Connect the mounting bracket to the local potential equalization system. |

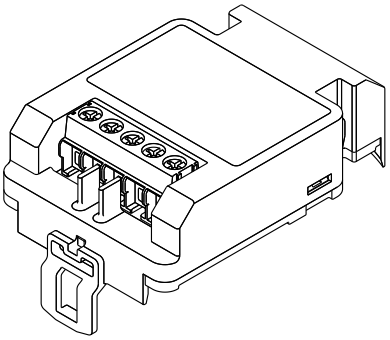
1) Feature 070 of the product structure
2) Feature 100 of the product structure

### 16.1.6 Remote display FHX50

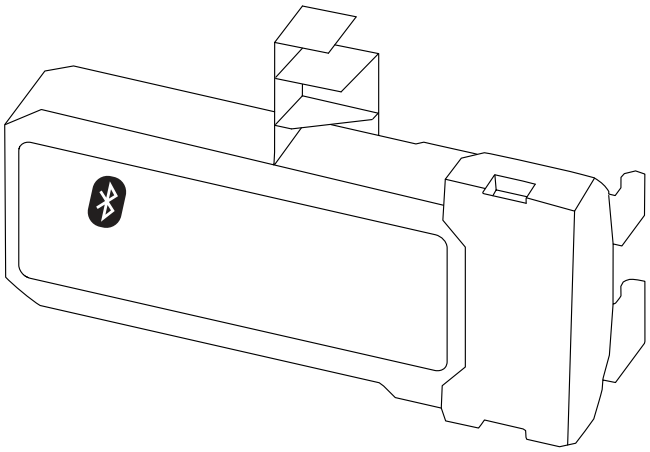
| Accessories | Description |
|---|---|
| Remote display FHX50 | <br>A0019128<br>▪ Material:<br>– Plastic PBT<br>– 316L/1.4404<br>– Aluminum<br>▪ Degree of protection: IP68 / NEMA 6P and IP66 / NEMA 4x<br>▪ Suitable for display modules:<br>– SD02 (push buttons)<br>– SD03 (touch control)<br>▪ Connecting cable:<br>– Cable supplied with device up to 30 m (98 ft)<br>– Standard cable supplied by customer up to 60 m (196 ft)<br>▪ Ambient temperature range: −40 to 80 °C (−40 to 176 °F)<br>▪ Ambient temperature range (option): −50 to 80 °C (−58 to 176 °F) [1]<br>▪ If the remote display should be used, order the device version "Prepared for display FHX50" (feature 030, version L, M or N). For the FHX50, you must select option A: "Prepared for display FHX50" under feature 050 "Measuring device version".<br>▪ If the device version "Prepared for display FHX50" was not originally ordered and a FHX50 display is to be retrofitted, you must select version B "Not prepared for display FHX50" under feature 050: "Measuring device version" when ordering the FHX50. In this case, a retrofit kit for the device is supplied with the FHX50. The kit can be used to prepare the device so that the FHX50 can be used.<br>Use of the FHX50 may be restricted for transmitters with an approval. A device can only be retrofitted with the FHX50 if the option L, M or N ("Prepared for FHX50") is listed under *Basic specifications*, item 4 "Display, operation" in the Safety Instructions (XA) for the device.<br>Also pay attention to the Safety Instructions (XA) of the FHX50.<br>Retrofitting is not possible on transmitters with:<br>▪ An approval for use in areas with flammable dust (dust ignition-proof approval)<br>▪ Ex nA type of protection<br>For details, see document SD01007F. |

1) This range is valid if option JN "Ambient temperature transmitter −50 °C (−58 °F)" has been selected in ordering feature 580 "Test, Certificate". If the temperature is permanently below −40 °C (−40 °F), failure rates may be increased.

### 16.1.7 Overvoltage protection

| Accessory | Description |
|---|---|
| Overvoltage protection for 2-wire-devices<br>OVP10 (1 channel)<br>OVP20 (2 channel) | <br>A0021734<br><br>**Technical data**<br>▪ Resistance per channel: 2 * 0.5 $\Omega_{max}$<br>▪ Threshold DC voltage: 400 to 700 V<br>▪ Threshold impulse voltage: < 800 V<br>▪ Capacitance at 1 MHz: < 1.5 pF<br>▪ Nominal arrest impulse voltage (8/20 µs): 10 kA<br>▪ Suited for wire cross-sections: 0.2 to 2.5 mm² (24 to 14 AWG)<br><br>**Ordering with device**<br>The overvoltage protection module is preferably ordered with the device. See product structure, feature 610 "Accessory mounted", option NA "Overvoltage protection". Separate ordering of the module is only necessary if a device is to retrofitted with the overvoltage protection.<br><br>**Order code for retrofitting**<br>▪ For 1-channel devices (feature 020, option A)<br>OVP10: 71128617<br>▪ For 2-channel devices (feature 020, option B, C, E or G)<br>OVP20 : 71128619<br><br>**Hosuing lid for retrofitting**<br>In order to keep the necessary safety distances, the housing lid needs to be replaced if the device is retrofitted with the overvoltage protection. Depending on the housing type, the order code of the suitable lid is as follows:<br>▪ GT18 housing: Lid 71185516<br>▪ GT19 housing: Lid 71185518<br>▪ GT20 housing: Lid 71185516<br><br>**Restrictions for retrofitting**<br>Depending on the approval of the transmitter the usage of the OVP module may be restricted. A device may only be retrofitted with an OVP module if the option *NA* (overvoltage protection) is quoted unter *Optional Specifications* in the Safety Instructions (XA) pertaining to the device.<br><br>For details refer to SD01090F. |

### 16.1.8 Bluetooth module for HART devices

| Accessory | Description |
|---|---|
| Bluetooth module |  A0036493 |

- Quick and easy commissioning via SmartBlue (app)
- No additional tools or adapters required
- Signal curve via SmartBlue (app)
- Encrypted single point-to-point data transmission (tested by Fraunhofer institue) and password protected communication via Bluetooth® wireless technology
- Range under reference conditions:
  > 10 m (33 ft)

When using the Bluetooth module the minimum supply voltage increases by up to 3 V.

**Ordering with device**
The Bluetooth module is preferably ordered with the device. See product structure, feature 610 "Accessory Mounted", option NF "Bluetooth". A separate order is only necessary in case of retrofitting.

**Order code for retrofitting**
Bluetooth module (BT10): 71377355

**Restrictions in case of retrofitting**
Depending on the approval of the transmitter, application of the Bluetooth module may be restricted. A device may only be retrofitted with a Bluetooth module if the option *NF* (Bluetooth) is listed in the associated Safety Instructions (XA) under *Optional specifications*.

For details refer to SD02252F.

## 16.2 Communication-specific accessories

| Accessory | Description |
|---|---|
| Commubox FXA291 | Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer.<br>Order code: 51516983<br>For details refer to Technical Information TI00405C |

| Accessory | Description |
|---|---|
| Field Xpert SFX350 | Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area**.<br>For details, see Operating Instructions BA01202S |

| Accessory | Description |
|---|---|
| Field Xpert SFX370 | Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area** and the **Ex area**.<br>For details, see Operating Instructions BA01202S |

## 16.3 Service-specific accessories

| Accessory | Description |
|---|---|
| DeviceCare SFE100 | Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus devices<br>Technical Information TI01134S<br>▪ DeviceCare is available for download at www.software-products.endress.com. The download requires a registration in the Endress+Hauser software portal.<br>▪ Alternatively, a DeviceCare DVD can be ordered with the device. Product structure: Feature 570 "Service", Option IV "Tooling DVD (DeviceCare Setup)". |
| FieldCare SFE500 | FDT-based Plant Asset Management tool.<br>Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices.<br>Technical Information TI00028S |

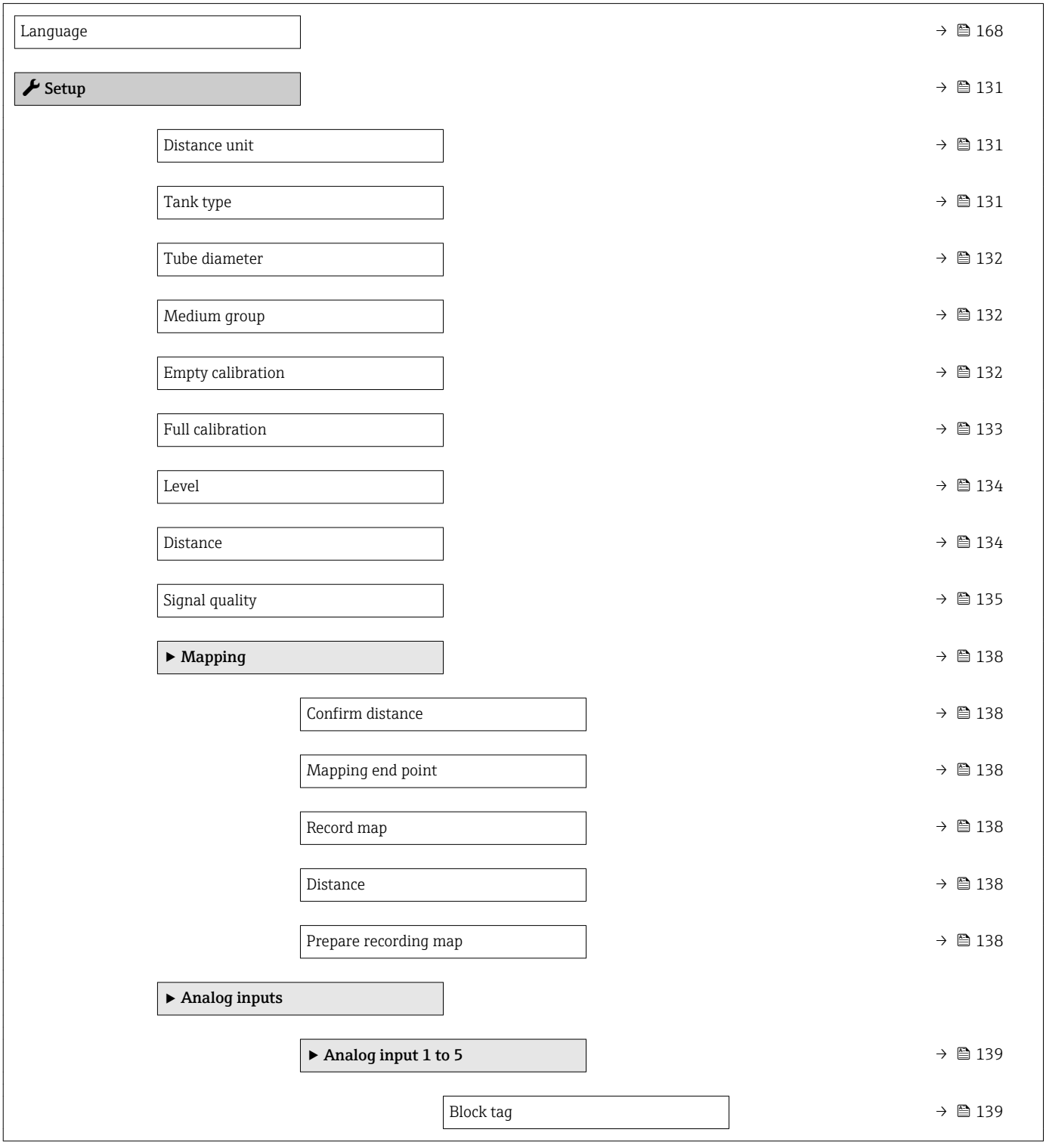
## 16.4 System components

| Accessory | Description |
|---|---|
| Graphic Data Manager Memograph M | The graphic data manager Memograph M provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick.<br>For details refer to Technical Information TI00133R and Operating Instructions BA00247R |

# 17 Operating menu

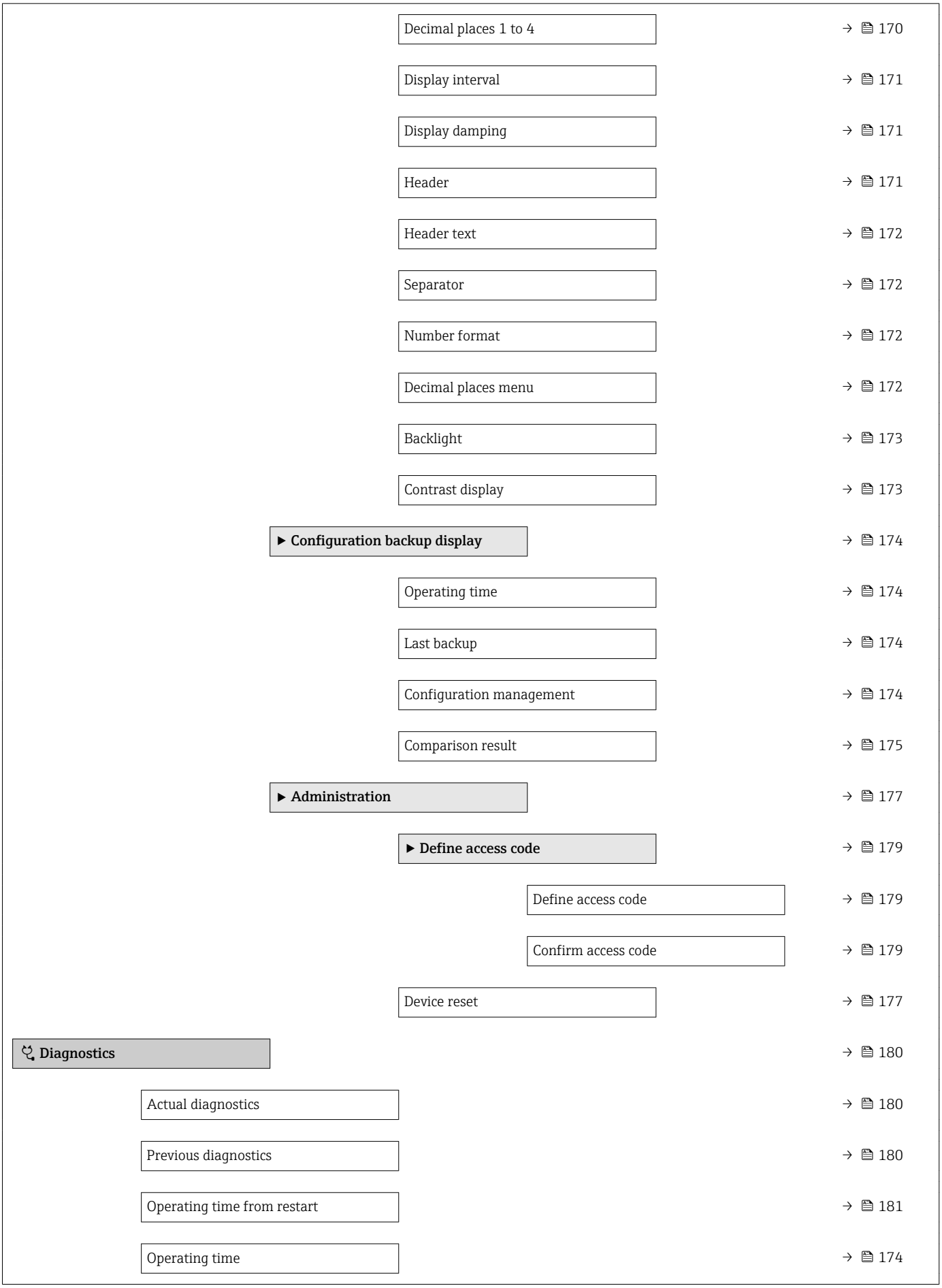
## 17.1 Overview of the operating menu (display module)

*Navigation* Operating menu

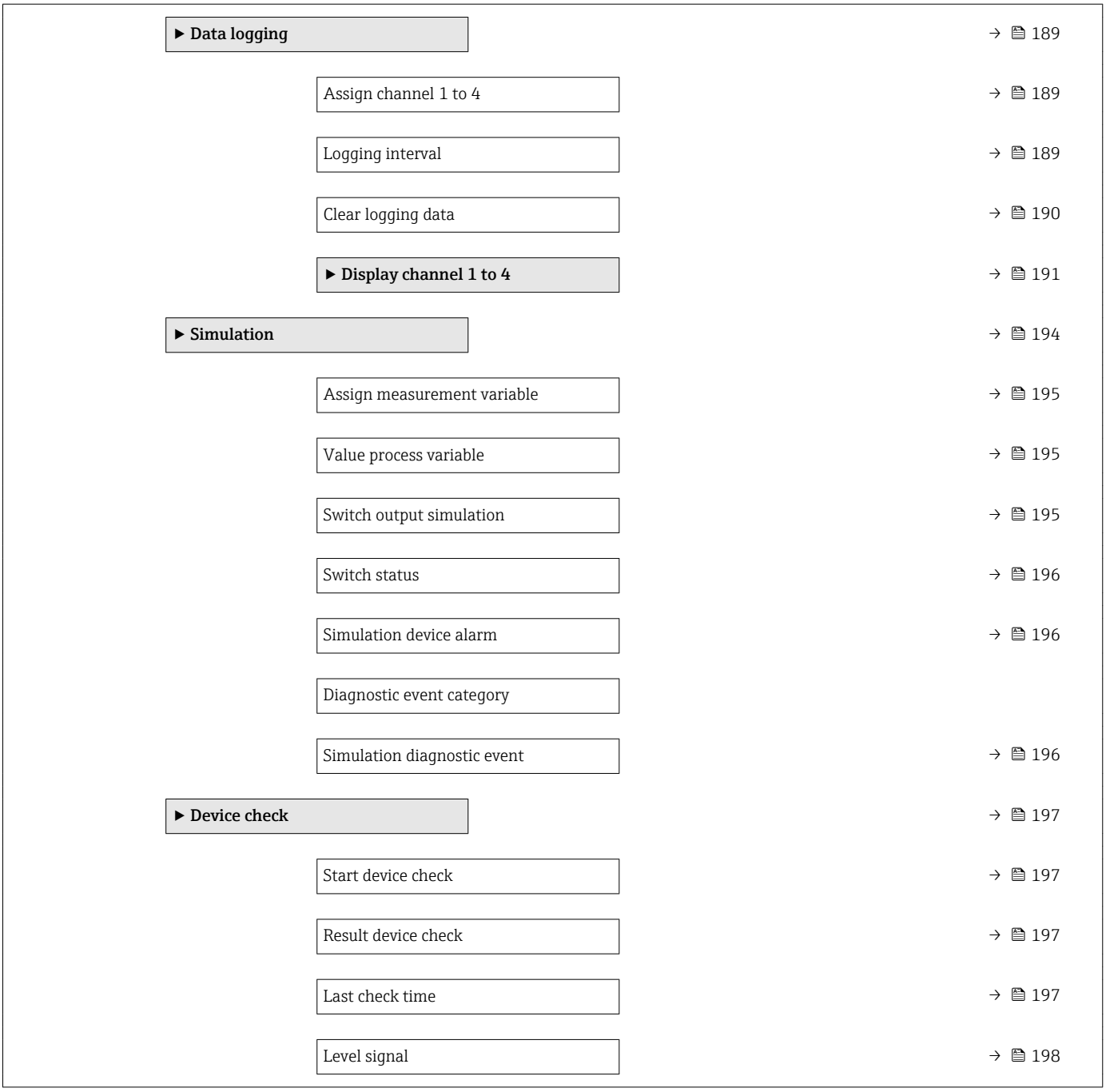


- Channel → 139
- Process Value Filter Time → 140
- ▶ **Advanced setup** → 141
  - Locking status → 141
  - Access status display → 141
  - Enter access code → 142
  - ▶ **Level** → 143
    - Medium type → 143
    - Medium property → 143
    - Max. filling speed liquid → 144
    - Max. draining speed liquid → 144
    - Advanced process conditions → 145
    - Level unit → 146
    - Blocking distance → 146
    - Level correction → 147
    - Tank/silo height → 147
  - ▶ **Linearization** → 150
    - Linearization type → 152
    - Unit after linearization → 153
    - Free text → 154
    - Maximum value → 155
    - Diameter → 155
    - Intermediate height → 155
    - Table mode → 156

- ▶ **Edit table**
  - Level → 157
  - Customer value → 158
  - Activate table → 158
- ▶ **Safety settings** → 159
  - Output echo lost → 159
  - Value echo lost → 159
  - Ramp at echo lost → 160
  - Blocking distance → 146
- ▶ **Switch output** → 162
  - Switch output function → 162
  - Assign status → 162
  - Assign limit → 163
  - Assign diagnostic behavior → 163
  - Switch-on value → 164
  - Switch-on delay → 165
  - Switch-off value → 165
  - Switch-off delay → 166
  - Failure mode → 166
  - Switch status → 166
  - Invert output signal → 166
- ▶ **Display** → 168
  - Language → 168
  - Format display → 168
  - Value 1 to 4 display → 170

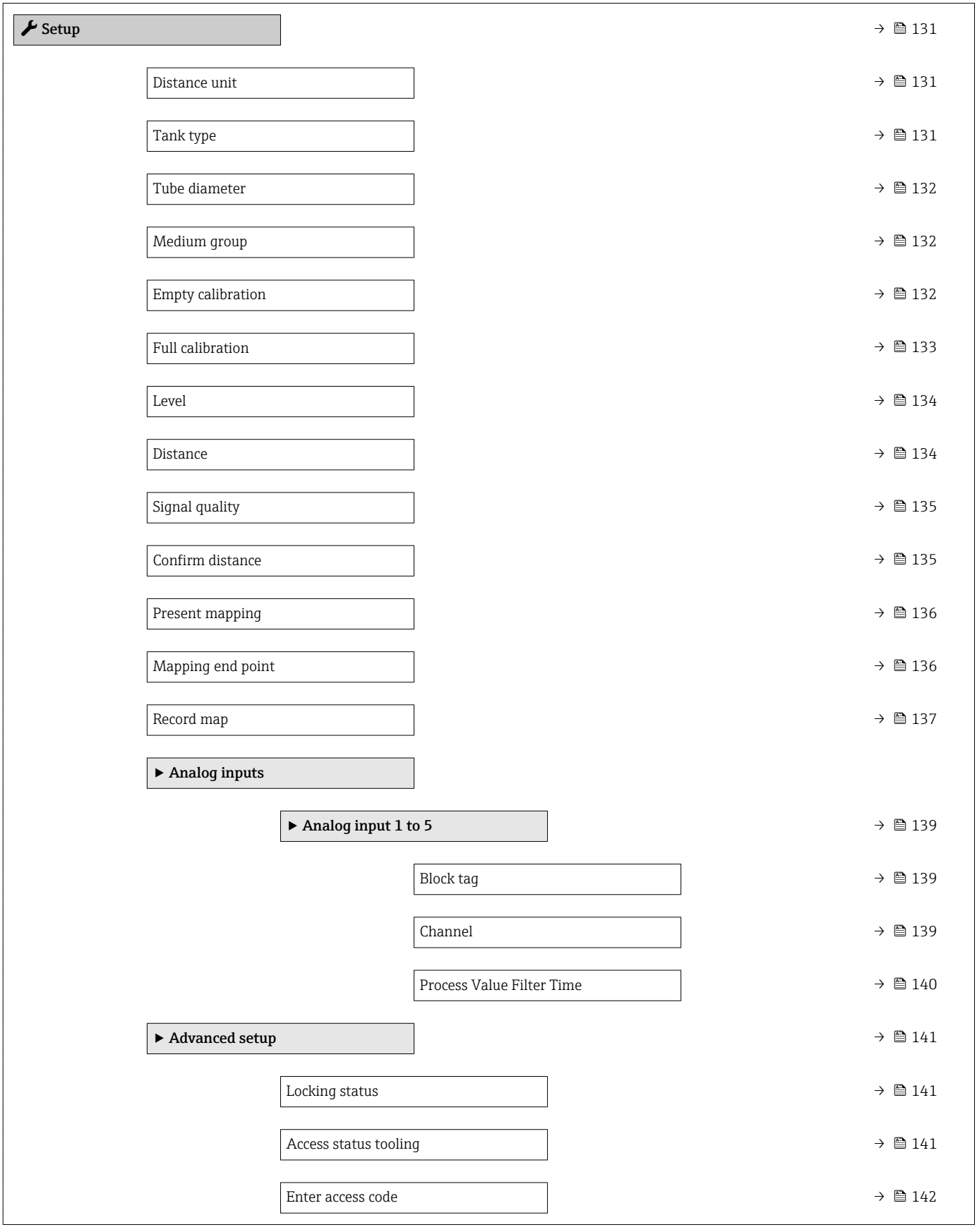

Decimal places 1 to 4 → 170
Display interval → 171
Display damping → 171
Header → 171
Header text → 172
Separator → 172
Number format → 172
Decimal places menu → 172
Backlight → 173
Contrast display → 173
▶ Configuration backup display → 174
Operating time → 174
Last backup → 174
Configuration management → 174
Comparison result → 175
▶ Administration → 177
▶ Define access code → 179
Define access code → 179
Confirm access code → 179
Device reset → 177
Diagnostics → 180
Actual diagnostics → 180
Previous diagnostics → 180
Operating time from restart → 181
Operating time → 174

- ▶ **Diagnostic list** → 182
  - Diagnostics 1 to 5 → 182
- ▶ **Event logbook** → 183
  - Filter options → 183
  - ▶ **Event list** → 183
- ▶ **Device information** → 184
  - Device tag → 184
  - Serial number → 184
  - Firmware version → 184
  - Device name → 185
  - Order code → 185
  - Extended order code 1 to 3 → 185
- ▶ **Measured values** → 186
  - Distance → 134
  - Level linearized → 154
  - Terminal voltage 1 → 187
  - Electronic temperature → 187
- ▶ **Analog inputs**
  - ▶ **Analog input 1 to 5** → 187
    - Block tag → 139
    - Channel → 139
    - Status → 188
    - Value → 188
    - Units index → 188


▶ Data logging → 189
Assign channel 1 to 4 → 189
Logging interval → 189
Clear logging data → 190
▶ Display channel 1 to 4 → 191
▶ Simulation → 194
Assign measurement variable → 195
Value process variable → 195
Switch output simulation → 195
Switch status → 196
Simulation device alarm → 196
Diagnostic event category
Simulation diagnostic event → 196
▶ Device check → 197
Start device check → 197
Result device check → 197
Last check time → 197
Level signal → 198

## 17.2 Overview of the operating menu (operating tool)

*Navigation* Operating menu



| | |
|---|---|
| ▶ **Level** | → 143 |
| Medium type | → 143 |
| Medium property | → 143 |
| Max. filling speed liquid | → 144 |
| Max. draining speed liquid | → 144 |
| Advanced process conditions | → 145 |
| Level unit | → 146 |
| Blocking distance | → 146 |
| Level correction | → 147 |
| Tank/silo height | → 147 |
| ▶ **Linearization** | → 150 |
| Linearization type | → 152 |
| Unit after linearization | → 153 |
| Free text | → 154 |
| Level linearized | → 154 |
| Maximum value | → 155 |
| Diameter | → 155 |
| Intermediate height | → 155 |
| Table mode | → 156 |
| Table number | → 157 |
| Level | → 157 |
| Level | → 158 |
| Customer value | → 158 |
| Activate table | → 158 |

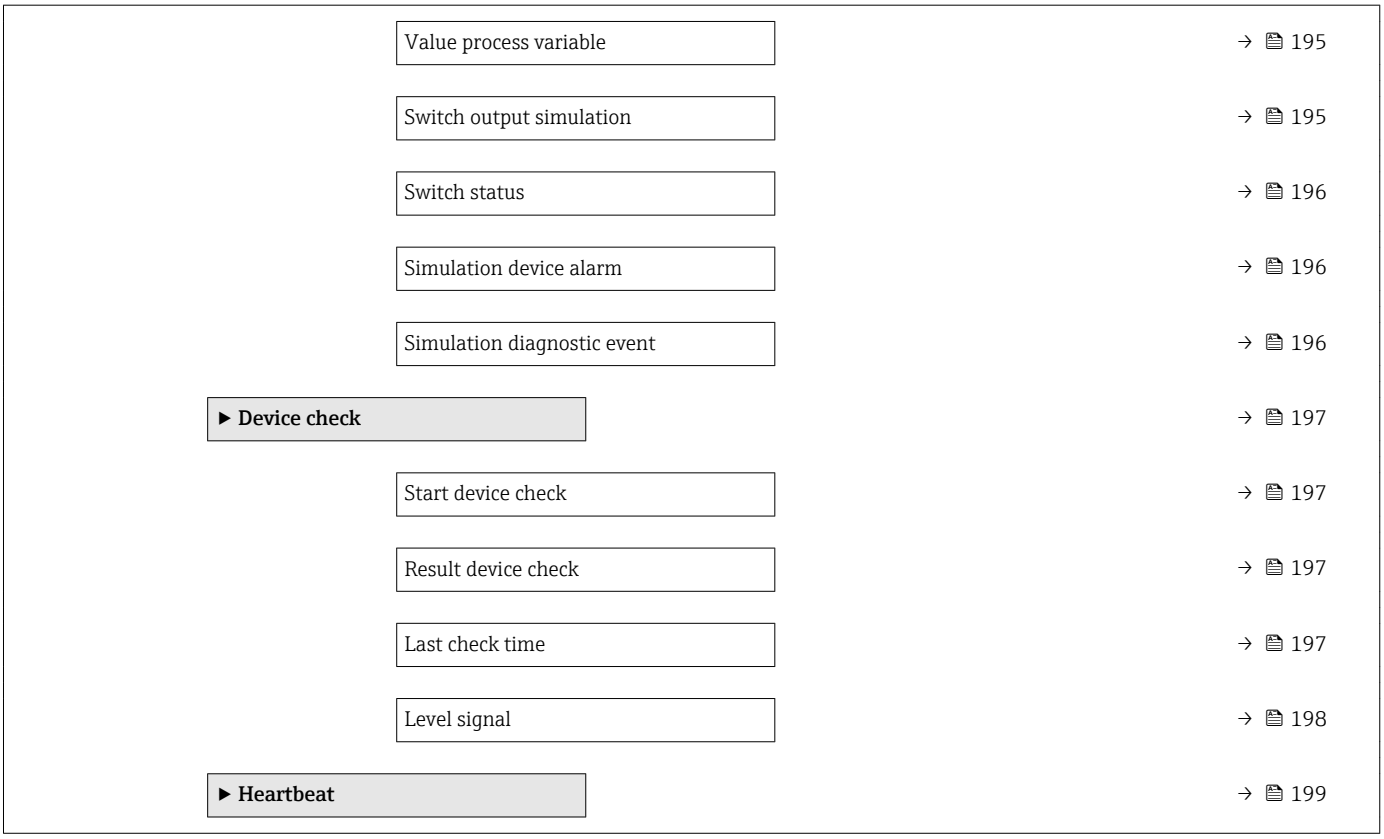
- ▶ **Safety settings** → 159
  - Output echo lost → 159
  - Value echo lost → 159
  - Ramp at echo lost → 160
  - Blocking distance → 146
- ▶ **Switch output** → 162
  - Switch output function → 162
  - Assign status → 162
  - Assign limit → 163
  - Assign diagnostic behavior → 163
  - Switch-on value → 164
  - Switch-on delay → 165
  - Switch-off value → 165
  - Switch-off delay → 166
  - Failure mode → 166
  - Switch status → 166
  - Invert output signal → 166
- ▶ **Display** → 168
  - Language → 168
  - Format display → 168
  - Value 1 to 4 display → 170
  - Decimal places 1 to 4 → 170
  - Display interval → 171
  - Display damping → 171
  - Header → 171

- Header text → 172
- Separator → 172
- Number format → 172
- Decimal places menu → 172
- Backlight → 173
- Contrast display → 173
- ▶ **Configuration backup display** → 174
  - Operating time → 174
  - Last backup → 174
  - Configuration management → 174
  - Backup state → 175
  - Comparison result → 175
- ▶ **Administration** → 177
  - Define access code → 179
  - Device reset → 177

**Diagnostics** → 180

- Actual diagnostics → 180
- Timestamp → 180
- Previous diagnostics → 180
- Timestamp → 181
- Operating time from restart → 181
- Operating time → 174
- ▶ **Diagnostic list** → 182
  - Diagnostics 1 to 5 → 182
  - Timestamp 1 to 5 → 182

- ▶ **Device information** → 184
  - Device tag → 184
  - Serial number → 184
  - Firmware version → 184
  - Device name → 185
  - Order code → 185
  - Extended order code 1 to 3 → 185
- ▶ **Measured values** → 186
  - Distance → 134
  - Level linearized → 154
  - Terminal voltage 1 → 187
  - Electronic temperature → 187
- ▶ **Analog inputs**
  - ▶ **Analog input 1 to 5** → 187
    - Block tag → 139
    - Channel → 139
    - Status → 188
    - Value → 188
    - Units index → 188
- ▶ **Data logging** → 189
  - Assign channel 1 to 4 → 189
  - Logging interval → 189
  - Clear logging data → 190
- ▶ **Simulation** → 194
  - Assign measurement variable → 195


Value process variable
→ 195
Switch output simulation
→ 195
Switch status
→ 196
Simulation device alarm
→ 196
Simulation diagnostic event
→ 196
▶ Device check
→ 197
Start device check
→ 197
Result device check
→ 197
Last check time
→ 197
Level signal
→ 198
▶ Heartbeat
→ 199

## 17.3 "Setup" menu

- : Marks the navigation path to the parameter via the display and operating module.
- : Marks the navigation path to the parameter via an operating tool (e.g. FieldCare).
- : Marks parameters which can be locked via the software locking.

*Navigation* Setup

### Distance unit

**Navigation** Setup → Distance unit

**Description** Length unit for distance calculation.

**Selection**

| *SI units* | *US units* |
|---|---|
| ▪ mm | ▪ ft |
| ▪ m | ▪ in |

**Factory setting** m

### Tank type

**Navigation** Setup → Tank type

**Prerequisite** **Medium type (→ 143) = Liquid**

**Description** Select tank type.

**Selection**
- Bypass / pipe
- Stilling well
- Workbench test
- Open channel
- Sphere
- Storage vessel
- Process vessel standard
- Process vessel with agitator
- Wave guide antenna

**Factory setting** Depending on the antenna

**Additional information** Depending on the antenna some of the options mentioned above may not be available or there may be additional options.

## Tube diameter

**Navigation** Setup → Tube diameter

**Prerequisite** **Tank type (→ 131) = Bypass / pipe**

**Description** Specify diameter of bypass or stilling well.

**User entry** 0 to 9.999 m

**Factory setting** 0 m

## Medium group

**Navigation** Setup → Medium group

**Prerequisite** **Medium type (→ 143) = Liquid**

**Description** Select medium group.

**Selection**
- Others
- Water based (DC >= 4)

**Factory setting** Others

**Additional information** This parameter roughly specifies the dielectric constant (DC) of the medium. For a more detailed definition of the DC use the **Medium property** parameter (→ 143).

The **Medium group** parameter presets the **Medium property** parameter (→ 143) as follows:

| Medium group | Medium property (→ 143) |
|---|---|
| Others | Unknown |
| Water based (DC >= 4) | DC 4 … 7 |

The **Medium property** parameter can be changed at a later point of time. However, when doing so, the **Medium group** parameter retains its value. Only the **Medium property** parameter is relevant for the signal evaluation.

The measuring range may be reduced for small dielectric constants. For details refer to the Technical Information (TI) of the respective device.

## Empty calibration

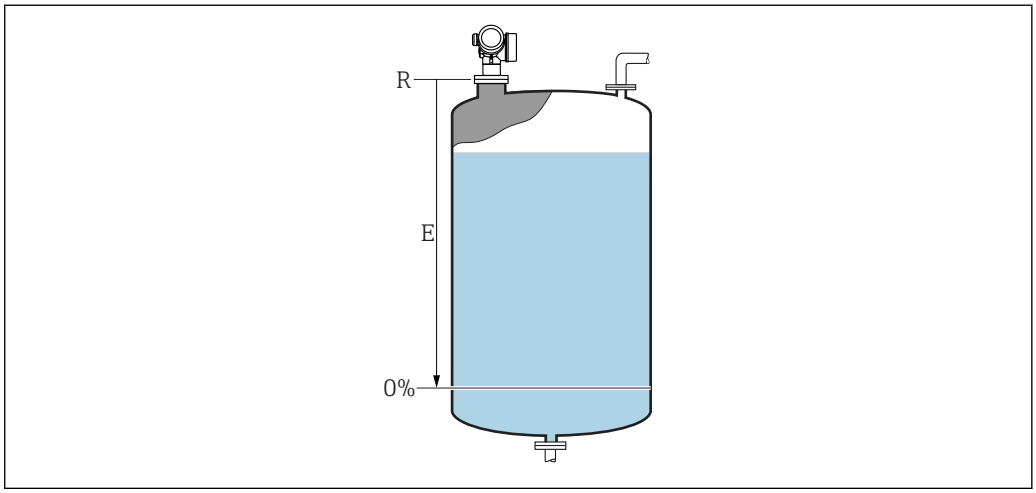
**Navigation** Setup → Empty calibration

**Description** Distance process connection to min. level.

**User entry** Depending on the antenna

**Factory setting** Depending on the antenna

**Additional information**




33 *Empty calibration (E) for level measurements in liquids*

The measuring range starts at the point at which the radar beam hits the tank or silo bottom. In the case of dished boiler ends or conical outlets levels below this point can not be measured.

## Full calibration

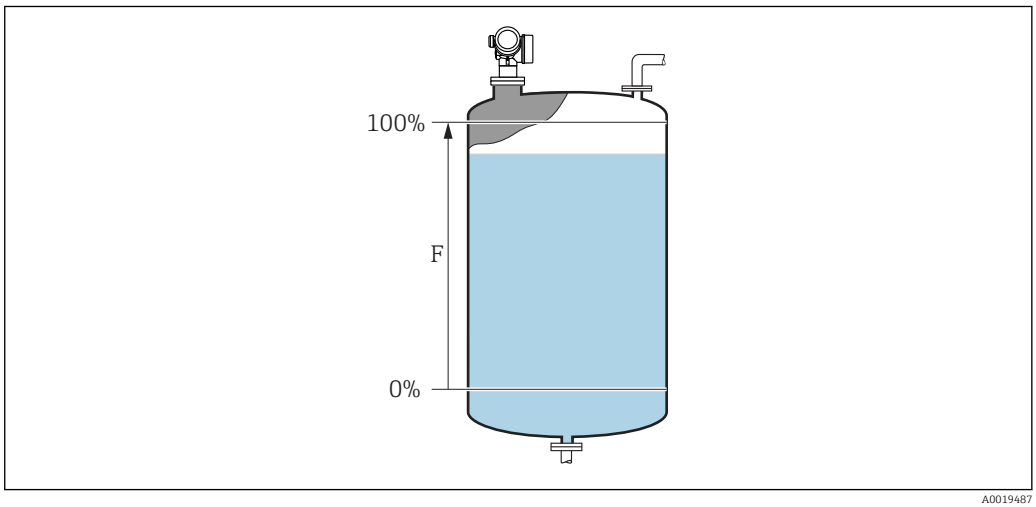
**Navigation** Setup → Full calibration

**Description** Span: max. level - min level.

**User entry** Depending on the antenna

**Factory setting** Depending on the antenna

**Additional information**



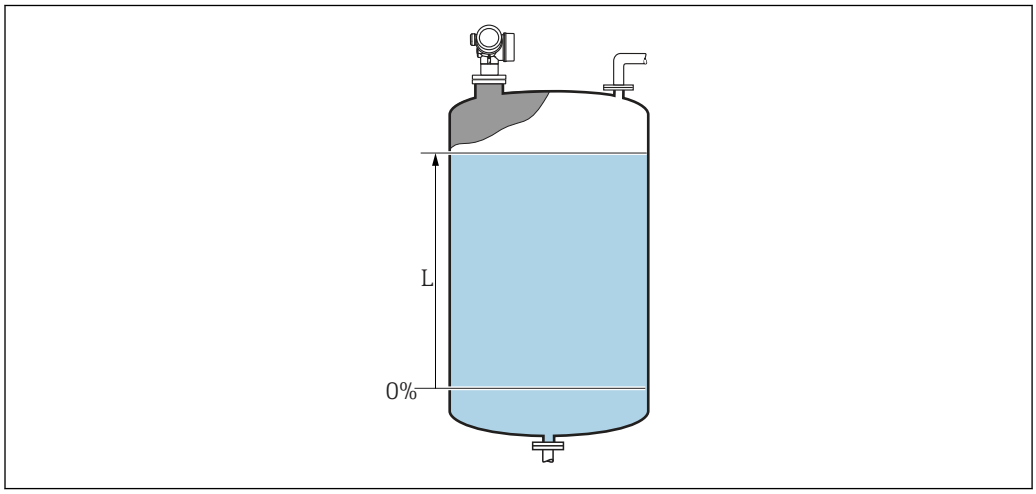

34 *Full calibration (F) for level measurements in liquids*

## Level

**Navigation** Setup → Level

**Description** Displays measured level L (before linearization).

**Additional information**




35 *Level in case of liquid measurements*

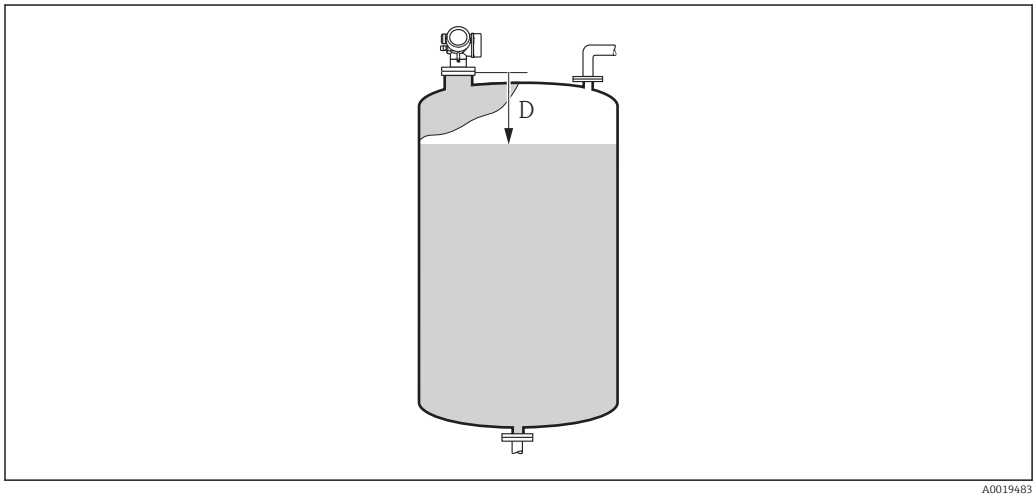
The unit is defined in the **Level unit** parameter (→ 146).

## Distance

**Navigation** Setup → Distance

**Description** Displays the measured distance D between the reference point (lower edge of the flange or threaded connection) and the level.

**Additional information**




36 *Distance for liquid measurements*

The unit is defined in the **Distance unit** parameter (→ 131).

## Signal quality

**Navigation** Setup → Signal quality

**Description** Displays the signal quality of the level echo.

**Additional information**

**Meaning of the display options**

- **Strong**
  The evaluated echo exceeds the threshold by at least 10 dB.
- **Medium**
  The evaluated echo exceeds the threshold by at least 5 dB.
- **Weak**
  The evaluated echo exceeds the threshold by less than 5 dB.
- **No signal**
  The device does not find a usable echo.

The signal quality indicated in this parameter always refers to the currently evaluated echo: either the level echo or the tank bottome echo. To differentiate between these two, the quality of the tank bottom echo echo is always displayed in brackets.

In case of a lost echo (**Signal quality = No signal**) the device generates the following error message:
- F941, for **Output echo lost (→ 159) = Alarm**.
- S941, if another option has been selected in **Output echo lost (→ 159)**.

## Confirm distance

**Navigation** Setup → Confirm distance

**Description** Specify, whether the measured distance matches the real distance.

Depending on the selection the device automatically sets the range of mapping.

**Selection**

- Manual map
- Distance ok
- Distance unknown
- Distance too small *
- Distance too big *
- Tank empty
- Factory map

**Factory setting** Distance unknown

**Additional information**

**Meaning of the options**

- **Manual map**
  To be selected if the range of mapping is to be defined manually in the **Mapping end point** parameter (→ 136). In this case it is not necessary to confirm the distance.
- **Distance ok**
  To be selected if the measured distance matches the actual distance. The device performs a mapping.
- **Distance unknown**
  To be selected if the actual distance is unknown. A mapping can not be performed in this case.

* Visibility depends on order options or device settings

- **Distance too small**
  To be selected if the measured distance is smaller than the actual distance. The device searches for the next echo and returns to the **Confirm distance** parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting **Distance ok**.
- **Distance too big** [7)]
  To be selected if the measured distance exceeds the actual distance. The device adjusts the signal evaluation and returns to the **Confirm distance** parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting **Distance ok**.
- **Tank empty**
  To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range as defined by the **Tank/silo height** parameter (→ 147). By default, **Tank/silo height** = **Empty calibration**.
  Take into account that in case of conical outlets, for example, a measurement is only possible up to the point at which the radar hits the bottom of the tank or silo. If the **Tank empty** option is used, **Empty calibration (→ 132)** and **Tank/silo height** may not reach below this point as otherwise the empty signal is suppressed.
- **Factory map**
  To be selected if the present mapping curve (if one exists) is to be deleted. The device returns to the **Confirm distance** parameter and a new mapping can be recorded.

When operating via the display module, the measured distance is displayed together with this parameter for reference purposes.

If the teaching procedure with the **Distance too small** option or the **Distance too big** option is quit before the distance has been confirmed, a map is **not** recorded and the teaching procedure is reset after 60 s.

### Present mapping

**Navigation** Setup → Present mapping

**Description** Indicates up to which distance a mapping has already been recorded.

### Mapping end point

**Navigation** Setup → Mapping end point

**Prerequisite** **Confirm distance (→ 135)** = **Manual map** or **Distance too small**

**Description** Specify new end of the mapping.

**User entry** 0.1 to 999 999.9 m

**Factory setting** 0.1 m

7) Only available for "Expert → Sensor → Echo tracking → **Evaluation mode** parameter" = "Short time history" or "Long time history"

**Additional information** This parameter defines up to which distance the new mapping is to be recorded. The distance is measured from the reference point, i.e. from the lower edge of the mounting flange or the threaded connection.

For reference purposes the **Present mapping** parameter (→ 136) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

## Record map

**Navigation** Setup → Record map

**Prerequisite** **Confirm distance (→ 135)** = **Manual map** or **Distance too small**

**Description** Start recording of the map.

**Selection**
- No
- Record map
- Overlay map
- Factory map
- Delete partial map

**Factory setting** No

**Additional information**

**Meaning of the options**
- **No**
  The map is not recorded.
- **Record map**
  The map is recorded. After the recording is completed, the new measured distance and the new mapping range appear on the display. When operating via the local display, these values must be confirmed by pressing ☑.
- **Overlay map**
  The new mapping curve is generated by overlaying the old and the current envelope curves.
- **Factory map**
  The factory map stored in the ROM of the device is used.
- **Delete partial map**
  The mapping curve is deleted up to **Mapping end point (→ 136)**.

### 17.3.1 "Mapping" wizard

The **Mapping** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the mapping are located directly in the **Setup** menu (→ 131).

In the **Mapping** wizard two parameters are displayed simultaneously on the display module at any one time. The upper parameter can be edited, whereas the lower parameter is displayed for reference purposes only.

*Navigation* Setup → Mapping

**Confirm distance**

**Navigation** Setup → Mapping → Confirm distance

**Description** → 135

**Mapping end point**

**Navigation** Setup → Mapping → Mapping end point

**Description** → 136

**Record map**

**Navigation** Setup → Mapping → Record map

**Description** → 137

**Distance**

**Navigation** Setup → Mapping → Distance

**Description** → 134

**Prepare recording map**

**Navigation** Setup → Mapping → Prepare recording map

**Description** Indicates the progress of the recording of the map.

**User interface**
- Init. recording
- In progress
- Finished

### 17.3.2 "Analog input 1 to 5" submenu

There is an **Analog inputs** submenu for every AI block of the device. The AI block is used to configure the measured value transmission to the bus.

Only the most basic properties of the AI block can be configured in this submenu. For a detailed configuration of the AI blocks refer to the **Expert** menu.

*Navigation* Setup → Analog inputs → Analog input 1 to 5

**Block tag**

**Navigation** Setup → Analog inputs → Analog input 1 to 5 → Block tag

**Description** Defined to be unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.

**Factory setting**

**Channel**

**Navigation** Setup → Analog inputs → Analog input 1 to 5 → Channel

**Description** Use this function to select the input value that should be processed in the Analog Input function block.

**Selection**
- Uninitialized
- Level linearized
- Absolute echo amplitude
- Distance
- Electronic temperature
- Relative echo amplitude
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Terminal voltage

**Factory setting** Uninitialized

## Process Value Filter Time

**Navigation** Setup → Analog inputs → Analog input 1 to 5 → Process Value Filter Time

**Description** Use this function to enter the filter time specification for the filtering of the unconverted input value (PV).

**User entry** Positive floating-point number

**Factory setting** 0 s

**Additional information** *Factory setting*

If the value 0 s is entered, filtering will not be performed.

### 17.3.3 "Advanced setup" submenu

*Navigation* Setup → Advanced setup

#### Locking status

**Navigation** Setup → Advanced setup → Locking status

**Description** Indicates the write protection with the highest priority that is currently active.

**User interface**
- Hardware locked
- Temporarily locked

**Additional information**

**Meaning and priorities of the types of write protection**
- **Hardware locked (priority 1)**
  The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters.
- **SIL locked (priority 2)**
  The SIL mode is activated. Writing access to the relevant parameters is denied.
- **WHG locked (priority 3)**
  The WHG mode is activated. Writing access to the relevant parameters is denied.
- **Temporarily locked (priority 4)**
  Write access to the parameters is temporarily locked on account of internal processes in progress in the device (e.g. data upload/download, reset etc.). The parameters can be modified as soon as the processes are complete.

On the display module, the -symbol appears in front of parameters that cannot be modified since they are write-protected.

#### Access status tooling

**Navigation** Setup → Advanced setup → Access status tooling

**Description** Shows the access authorization to the parameters via the operating tool.

**Additional information**

The access authorization can be changed via the **Enter access code** parameter (→ 142).

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→ 141).

#### Access status display

**Navigation** Setup → Advanced setup → Access status display

**Prerequisite** The device has a local display.

**Description** Indicates access authorization to parameters via local display.

**Additional information**

The access authorization can be changed via the **Enter access code** parameter (→ 142).

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→ 141).

## Enter access code

**Navigation** Setup → Advanced setup → Enter access code

**Description** Enter access code to disable write protection of parameters.

**User entry** 0 to 9 999

**Additional information**

- For local operation, the customer-specific access code, which has been defined in the **Define access code** parameter (→ 177), has to be entered.
- If an incorrect access code is entered, the user retains his current access authorization.
- The write protection affects all parameters marked with the -symbol in this document. On the local display, the -symbol in front of a parameter indicates that the parameter is write-protected.
- If no key is pressed for 10 min, or the user switches from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after another 60 s.

Please contact your Endress+Hauser Sales Center if you lose your access code.

### "Level" submenu

*Navigation* Setup → Advanced setup → Level

## Medium type

**Navigation** Setup → Advanced setup → Level → Medium type

**Description** Specify type of medium.

**User interface**
- Liquid
- Solid

**Factory setting** FMR50, FMR51, FMR52, FMR53, FMR54: **Liquid**

**Additional information** This parameter determines the value of several other parameters and strongly influences the complete signal evaluation. Therefore, it is strongly recommended **not to change** the factory setting.

## Medium property

**Navigation** Setup → Advanced setup → Level → Medium property

**Description** Specify relative dielectric constant $\varepsilon_r$ of the medium.

**Selection**
- Unknown
- DC 1.4 ... 1.6
- DC 1.6 ... 1.9
- DC 1.9 ... 2.5
- DC 2.5 ... 4
- DC 4 ... 7
- DC 7 ... 15
- DC > 15

**Factory setting** Dependent on **Medium type (→ 143)** and **Medium group (→ 132)**.

**Additional information** *Dependency on "Medium type" and "Medium group"*

| Medium type (→ 143) | Medium group (→ 132) | Medium property |
|---|---|---|
| Solid | | Unknown |
| Liquid | Water based (DC >= 4) | DC 4 ... 7 |
| | Others | Unknown |

For dielectric constants (DC values) of many media commonly used in various industries refer to:
- the Endress+Hauser DC manual (CP01076F)
- the Endress+Hauser "DC Values App" (available for Android and iOS)

## Max. filling speed liquid

**Navigation** Setup → Advanced setup → Level → Max. filling speed liquid

**Prerequisite** **Medium type (→ 143) = Liquid**

**Description** Select expected maximum filling speed.

**Selection**
- Slow < 1cm (0,4in) /min
- Medium < 10cm (4in) /min
- Standard < 1m (40in) /min
- Fast < 2m (80in) /min
- Very fast > 2m (80in) /min
- No filter / test

**Factory setting** Depending on the **Tank type** parameter (→ 131)

**Additional information** The device adjusts the signal evaluation filters and the damping of the output signal to the typical rate of level change defined in this parameter:

| Max. filling speed liquid | Step response time / s |
|---|---|
| Slow < 1cm (0,4in) /min | 90 |
| Medium < 10cm (4in) /min | 50 |
| Standard < 1m (40in) /min | 20 |
| Fast < 2m (80in) /min | 8 |
| Very fast > 2m (80in) /min | 5 |
| No filter / test | < 1 |

**Max. filling speed liquid** is preset by **Tank type (→ 131)**. It can, however, be adjusted to the process in the vessel at any time. If **Tank type (→ 131)** is changed again at a later point of time, it may be necessary to repeat the fine adjustment.

## Max. draining speed liquid

**Navigation** Setup → Advanced setup → Level → Max. draining speed liquid

**Prerequisite** **Medium type (→ 143) = Liquid**

**Description** Select expected maximum draining speed.

**Selection**
- Slow < 1cm (0,4in) /min
- Medium < 10cm (4in) /min
- Standard < 1m (40in) /min
- Fast < 2m (80in) /min
- Very fast > 2m (80in) /min
- No filter / test

**Factory setting** Depending on the **Tank type** parameter (→ 131)

**Additional information**

The device adjusts the signal evaluation filters and the damping of the output signal to the typical rate of level change defined in this parameter:

| Max. draining speed liquid (→ 144) | Step response time / s |
|---|---|
| Slow < 1cm (0,4in) /min | 90 |
| Medium < 10cm (4in) /min | 50 |
| Standard < 1m (40in) /min | 20 |
| Fast < 2m (80in) /min | 8 |
| Very fast > 2m (80in) /min | 5 |
| No filter / test | < 1 |

**Max. draining speed liquid (→ 144)** is preset by **Tank type (→ 131)**. It can, however, be adjusted to the process in the vessel at any time. If **Tank type (→ 131)** is changed again at a later point of time, it may be necessary to repeat the fine adjustment.

## Advanced process conditions

**Navigation**

Setup → Advanced setup → Level → Advanced process conditions

**Description**

Specify additional process conditions (if required).

**Selection**

- Foam (>5cm/0,16ft)
- Changing DC values
- Small tanks (< 1m/3ft)

**Factory setting**

None

**Additional information**

*"Foam (>5cm/0,16ft)" option*

This option makes sure that no tank history is used which has been recorded while foam was present at the surface and thus is no reliable map of the tank property. To achieve this, the setting **Evaluation mode** = **Long time history** is deactivated.

The **Foam (>5cm/0,16ft)** option is only available for liquid applications (FMR50, FMR51, FMR52, FMR53, FMR54).

*"Changing DC values" option*

A tank history which has been recorded with **Evaluation mode** = **Long time history** is only valid for a fixed dielectric constant. The **Changing DC values** option disables the setting **Evaluation mode** = **Long time history** and thus avoids wrong measuring values in the case of a changing dielectric constant.

The **Changing DC values** option is only available for liquid applications (FMR50, FMR51, FMR52, FMR53, FMR54).

*"Small tanks (< 1m/3ft)" option*

This option provides a simple possibility to reduce the echo width of the sensor module. This enables an improved detection of superimposed echos - especially in the near field. Internally, all paramters related to the echo width are adjusted by this option.

The **Small tanks (< 1m/3ft)** option is only available for liquid measurements with 26 GHz HF module (FMR50, FMR51, FMR52).

## Level unit

**Navigation** Setup → Advanced setup → Level → Level unit

**Description** Select level unit.

**Selection**

*SI units*
- %
- m
- mm

*US units*
- ft
- in

**Factory setting** %

**Additional information** The level unit may differ from the distance unit defined in the **Distance unit** parameter (→ 131):

- The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty calibration (→ 132)** and **Full calibration (→ 133)**).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

## Blocking distance

**Navigation** Setup → Advanced setup → Level → Blocking distance

**Description** Specify blocking distance BD.

**User entry** 0 to 200 m

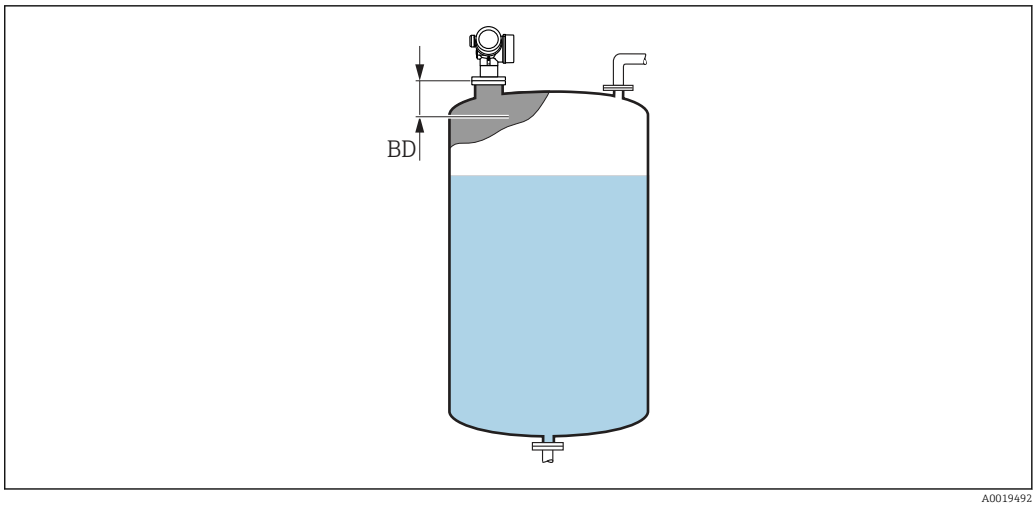
**Factory setting** FMR50, FMR51, FMR53, FMR54: antenna length

**Additional information** Signals in the blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance due to a level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

This behavior is only valid if the following two conditions are met:
- Expert → Sensor → Echo tracking → Evaluation mode = **Short time history** or **Long time history**
- Expert → Sensor → Gas phase compensation → GPC mode= **On**, **Without correction** or **External correction**

If one of these conditions is not met, signals in the blocking distance will always be ignored.

If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.




37 *Blocking distance (BD) for liquid measurements*

## Level correction

**Navigation** Setup → Advanced setup → Level → Level correction

**Description** Specify level correction (if required).

**User entry** −200 000.0 to 200 000.0 %

**Factory setting** 0.0 %

**Additional information** The value specified in this parameter is added to the measured level (before linearization).

## Tank/silo height

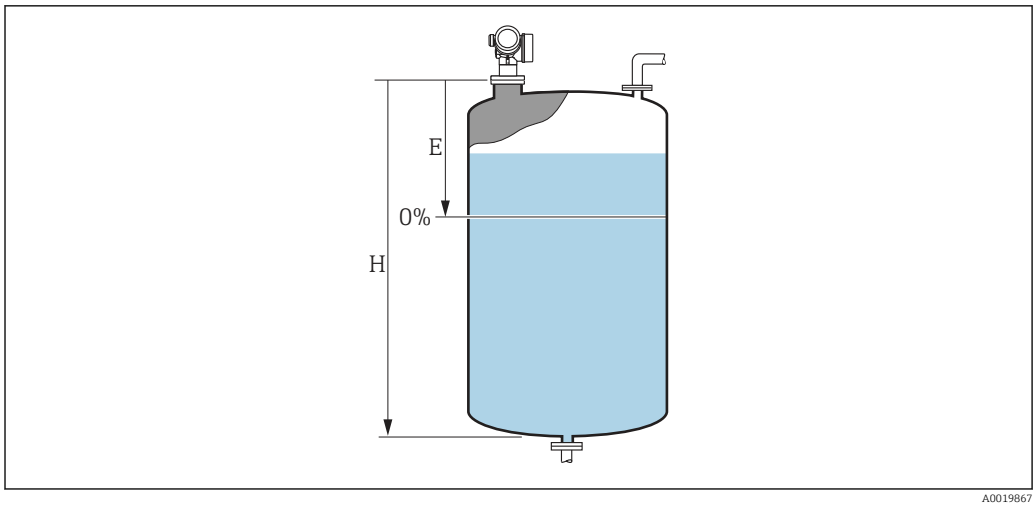
**Navigation** Setup → Advanced setup → Level → Tank/silo height

**Description** Specify total height of the tank or silo as measured from the process connection.

**User entry** −999.9999 to 999.9999 m

**Factory setting** **Empty calibration (→ 132)**

**Additional information** If the parametrized measuring range (**Empty calibration (→ 132)**) differs significantly from the tank or silo height, it is recommended to enter the tank or silo height. Example: Continuous level monitoring in the upper third of a tank or silo.

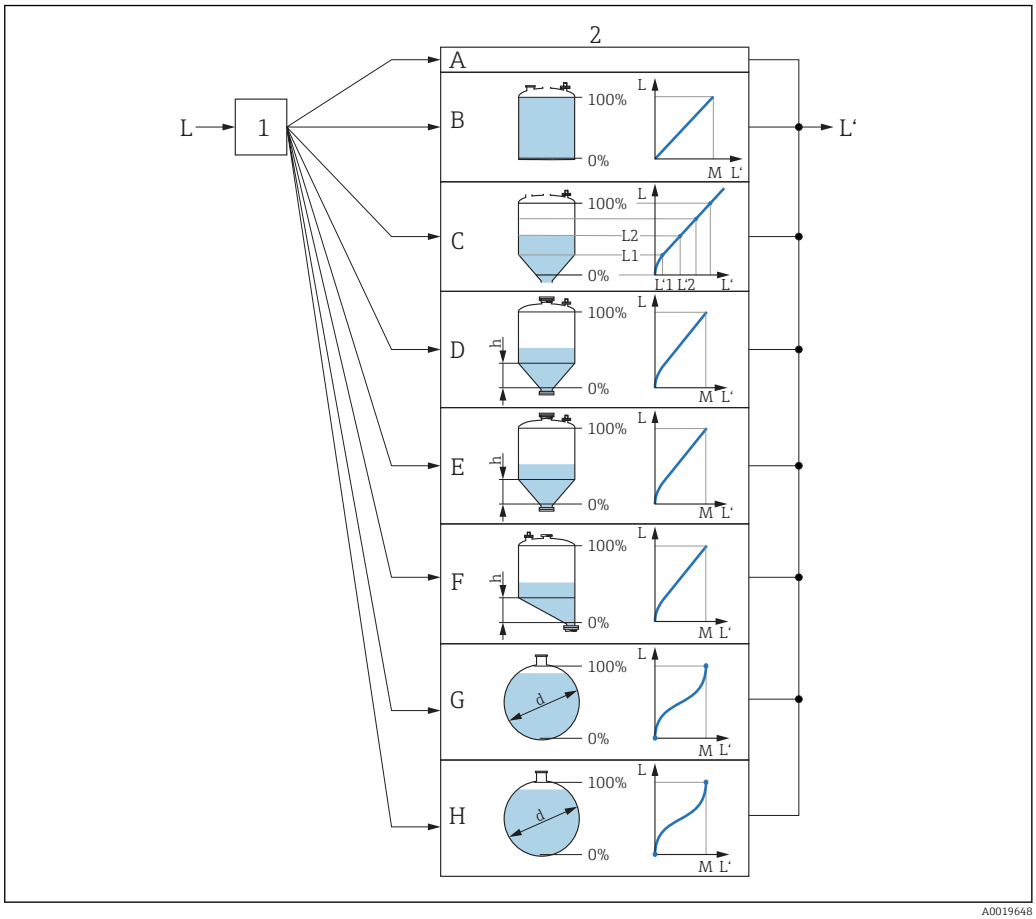



*38 "Tank/silo height" parameter (→ 147)' for measurements in liquids*

*E Empty calibration (→ 132)*
*H Tank/silo height (→ 147)*

For tanks with conical outlet, **Tank/silo height** should not be changed as in this type of applications **Empty calibration (→ 132)** is usually **not** << the tank or silo height.

## "Linearization" submenu

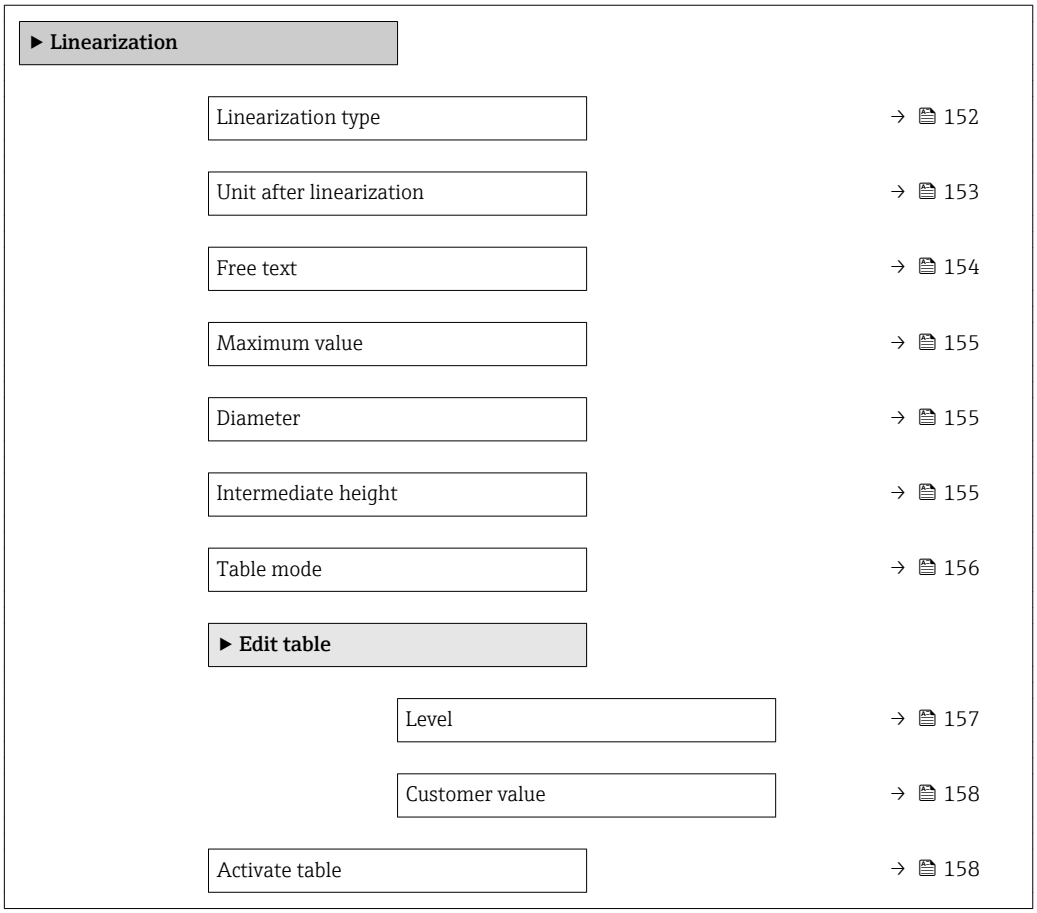



39 *Linearization: Transformation of the level and (if relevant) the interface height into a volume or weight; the transformation is dependent on the shape of the vessel.*

*1 Selection of linearization type and unit*
*2 Configuration of the linearization*
*A Linearization type (→ 152) = None*
*B Linearization type (→ 152) = Linear*
*C Linearization type (→ 152) = Table*
*D Linearization type (→ 152) = Pyramid bottom*
*E Linearization type (→ 152) = Conical bottom*
*F Linearization type (→ 152) = Angled bottom*
*G Linearization type (→ 152) = Horizontal cylinder*
*H Linearization type (→ 152) = Sphere*
*L Level before linearization (measured in distance units)*
*L' Level linearized (→ 154) (corresponds to volume or weight)*
*M Maximum value (→ 155)*
*d Diameter (→ 155)*
*h Intermediate height (→ 155)*

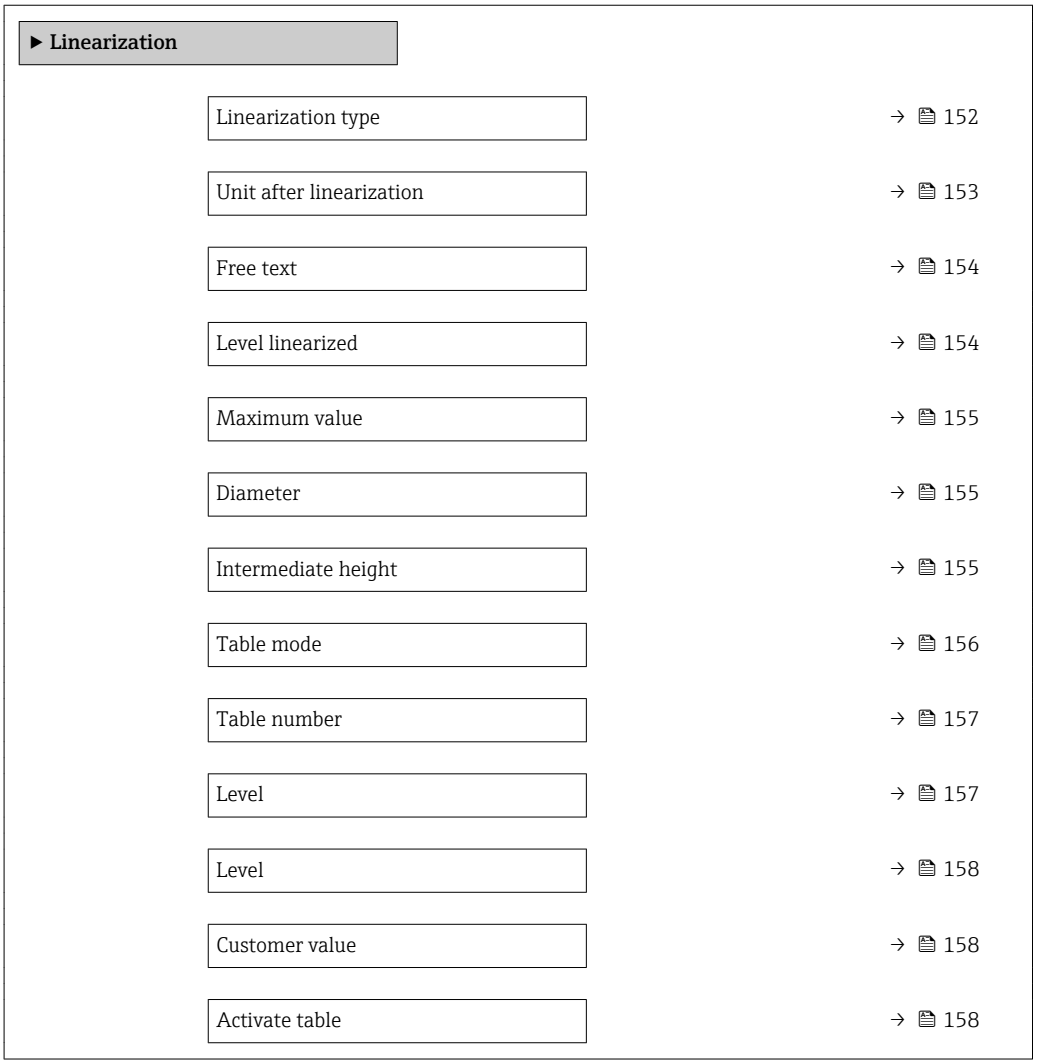
*Structure of the submenu on the display module*

*Navigation* Setup → Advanced setup → Linearization



*Structure of the submenu in an operating tool (e.g. FieldCare)*

*Navigation* Setup → Advanced setup → Linearization



*Description of parameters*

*Navigation* Setup → Advanced setup → Linearization

## Linearization type

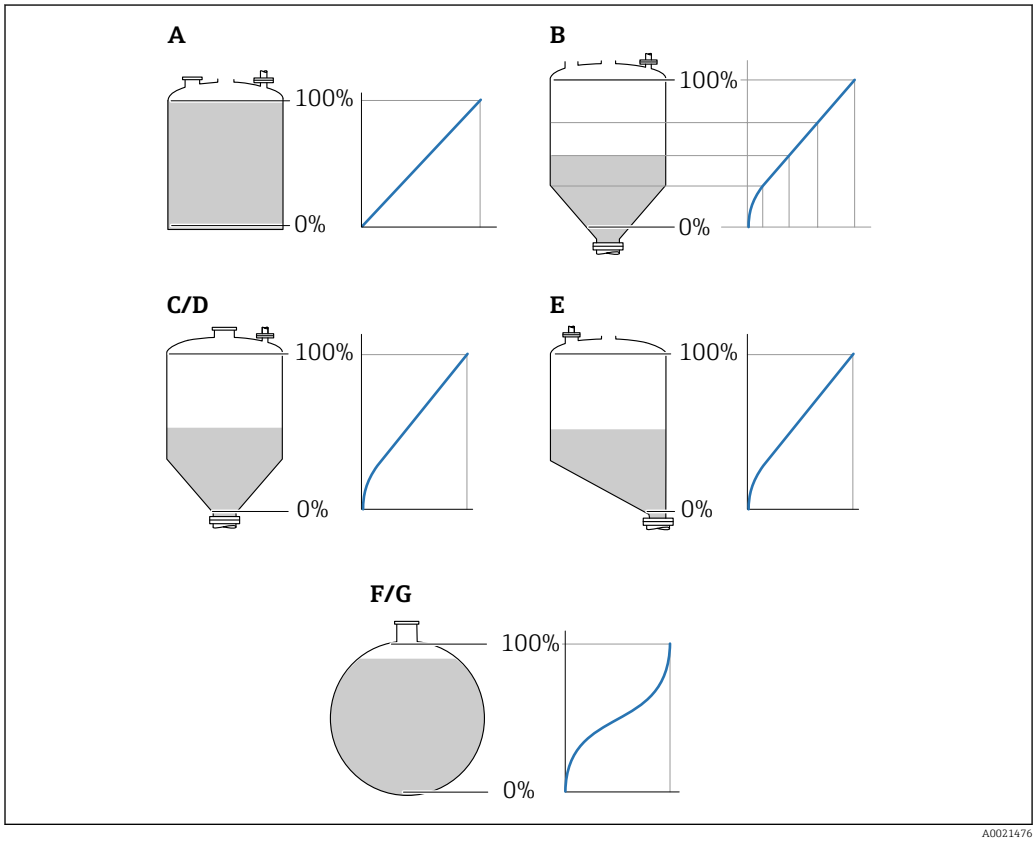
**Navigation** Setup → Advanced setup → Linearization → Linearization type

**Description** Select linearization type.

**Selection**
- None
- Linear
- Table
- Pyramid bottom
- Conical bottom
- Angled bottom
- Horizontal cylinder
- Sphere

**Factory setting** None

**Additional information**




*40 Linearization types*

*A None*
*B Table*
*C Pyramid bottom*
*D Conical bottom*
*E Angled bottom*
*F Sphere*
*G Horizontal cylinder*

**Meaning of the options**

- **None**
  The level is transmitted in the level unit without linearization.
- **Linear**
  The output value (volume/weight) is directly proportional to the level L. This is valid, for example, for vertical cylinders. The following additional parameters have to be specified:
  – **Unit after linearization (→ 153)**
  – **Maximum value (→ 155)**: Maximum volume or weight
- **Table**
  The relationship between the measured level L and the output value (volume/weight) is given by a linearization table consisting of up to 32 pairs of values "level - volume" or "level - weight", respectively. The following additional parameters have to be specified:
  – **Unit after linearization (→ 153)**
  – **Table mode (→ 156)**
  – For each table point: **Level (→ 157)**
  – For each table point: **Customer value (→ 158)**
  – **Activate table (→ 158)**
- **Pyramid bottom**
  The output value corresponds to the volume or weight in a silo with pyramid bottom. The following additional parameters have to be specified:
  – **Unit after linearization (→ 153)**
  – **Maximum value (→ 155)**: Maximum volume or weight
  – **Intermediate height (→ 155)**: The height of the pyramid
- **Conical bottom**
  The output value corresponds to the volume or weight in a tank with conical bottom. The following additional parameters have to be specified:
  – **Unit after linearization (→ 153)**
  – **Maximum value (→ 155)**: Maximum volume or weight
  – **Intermediate height (→ 155)**: The height of the conical part of the tank
- **Angled bottom**
  The output value corresponds to the volume or weight in a silo with an angled bottom. The following additional parameters have to be specified:
  – **Unit after linearization (→ 153)**
  – **Maximum value (→ 155)**: Maximum volume or weight
  – **Intermediate height (→ 155)**: Height of the angled bottom
- **Horizontal cylinder**
  The output value corresponds to the volume or weight in a horizontal cylinder. The following additional parameters have to be specified:
  – **Unit after linearization (→ 153)**
  – **Maximum value (→ 155)**: Maximum volume or weight
  – **Diameter (→ 155)**
- **Sphere**
  The output value corresponds to the volume or weight in a spherical tank. The following additional parameters have to be specified:
  – **Unit after linearization (→ 153)**
  – **Maximum value (→ 155)**: Maximum volume or weight
  – **Diameter (→ 155)**

## Unit after linearization

**Navigation** Setup → Advanced setup → Linearization → Unit after linearization

**Prerequisite** **Linearization type (→ 152)** ≠ None

**Description** Select unit of the lineaized value.

**Selection**

*SI units*
- STon
- t
- kg
- $cm^3$
- $dm^3$
- $m^3$
- hl
- l
- %

*US units*
- lb
- UsGal
- $ft^3$

*Imperial units*
impGal

*Custom-specific units*
Free text

**Factory setting**

%

**Additional information**

The selected unit is only used to be indicated on the display. The measured value is **not** transformed according to the selected unit.

It is also possible to configure a distance-to-distance linearization, i.e. a transformation from the level unit to a different distance unit. To do so, select the **Linear** linearization mode. In order to define the new level unit, select the **Free text** option in the **Unit after linearization** parameter and enter the required unit into the **Free text** parameter (→ 154).

## Free text

**Navigation**

Setup → Advanced setup → Linearization → Free text

**Prerequisite**

**Unit after linearization (→ 153) = Free text**

**Description**

Enter unit symbol.

**User entry**

Up to 32 alphanumerical characters (letters, numbers, special characters)

**Factory setting**

Free text

## Level linearized

**Navigation**

Setup → Advanced setup → Linearization → Level linearized

**Description**

Displays linearized level.

**Additional information**

The unit is defined by the **Unit after linearization** parameter → 153.

### Maximum value

**Navigation** Setup → Advanced setup → Linearization → Maximum value

**Prerequisite** **Linearization type (→ 152)** has one of the following values:
- Linear
- Pyramid bottom
- Conical bottom
- Angled bottom
- Horizontal cylinder
- Sphere

**User entry** −50 000.0 to 50 000.0 %

**Factory setting** 100.0 %

### Diameter

**Navigation** Setup → Advanced setup → Linearization → Diameter

**Prerequisite** **Linearization type (→ 152)** has one of the following values:
- Horizontal cylinder
- Sphere

**User entry** 0 to 9 999.999 m

**Factory setting** 2 m

**Additional information** The unit is defined in the **Distance unit** parameter (→ 131).

### Intermediate height

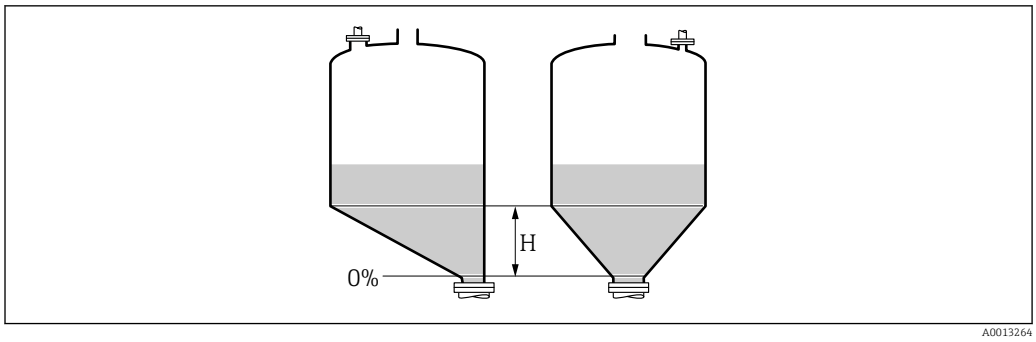
**Navigation** Setup → Advanced setup → Linearization → Intermediate height

**Prerequisite** **Linearization type (→ 152)** has one of the following values:
- Pyramid bottom
- Conical bottom
- Angled bottom

**User entry** 0 to 200 m

**Factory setting** 0 m

**Additional information**




*H Intermediate height*

The unit is defined in the **Distance unit** parameter (→ 131).

## Table mode

**Navigation** Setup → Advanced setup → Linearization → Table mode

**Prerequisite** **Linearization type (→ 152) = Table**

**Description** Select editing mode of the linearization table.

**Selection**
- Manual
- Semiautomatic *
- Clear table
- Sort table

**Factory setting** Manual

**Additional information**

**Meaning of the options**
- **Manual**
  The level and the associated linearized value are entered manually for each linearization point.
- **Semiautomatic**
  The level is measured by the device for each linearization point. The associated linearized value is entered manually.
- **Clear table**
  Deletes the existing linearization table.
- **Sort table**
  Rearranges the linerization points into an ascending order.

* Visibility depends on order options or device settings

**Conditions the linearization table must meet:**
- The table may consist of up to 32 pairs of values "Level - Linearized Value".
- The table must be monotonic (monotonically increasing or decreasing).
- The first linearization point must refer to the minimum level.
- The last linearization point must refer to the maximum level.

Before entering a linearization table, the values for **Empty calibration (→ 132)** and **Full calibration (→ 133)** must be set correctly.

If values of the table need to be changed after the full or empty calibration have been changed, a correct evaluation is only ensured if the existing table is deleted and the complete table is entered again. To do so delete the existing table (**Table mode (→ 156)** = **Clear table**). Then enter a new table.

**How to enter the table**
- Via FieldCare
  The table points can be entered via the **Table number (→ 157)**, **Level (→ 157)** and **Customer value (→ 158)** parameters. As an alternative, the graphic table editor may be used: Device Operation → Device Functions → Additional Functions → Linearization (Online/Offline)
- Via local display
  Select the **Edit table** submenu to call up the graphic table editor. The table is displayed and can be edited line by line.

The factory setting for the level unit is "%". If you want to enter the linearization table in physical units, you must select the appropriate unit in the **Level unit** parameter (→ 146) beforehand.

## Table number

**Navigation** Setup → Advanced setup → Linearization → Table number

**Prerequisite** **Linearization type (→ 152)** = **Table**

**Description** Select table point you are going to enter or change.

**User entry** 1 to 32

**Factory setting** 1

## Level (Manual)

**Navigation** Setup → Advanced setup → Linearization → Level

**Prerequisite**
- **Linearization type (→ 152)** = Table
- **Table mode (→ 156)** = Manual

**Description** Enter level value of the table point (value before linearization).

**User entry** Signed floating-point number

**Factory setting** 0 %

## Level (Semiautomatic)

**Navigation** Setup → Advanced setup → Linearization → Level

**Prerequisite**
- **Linearization type (→ 152)** = **Table**
- **Table mode (→ 156)** = **Semiautomatic**

**Description** Displays measured level (value before linearization). This value is transmitted to the table.

## Customer value

**Navigation** Setup → Advanced setup → Linearization → Customer value

**Prerequisite** **Linearization type (→ 152)** = **Table**

**Description** Enter linearized value for the table point.

**User entry** Signed floating-point number

**Factory setting** 0 %

## Activate table

**Navigation** Setup → Advanced setup → Linearization → Activate table

**Prerequisite** **Linearization type (→ 152)** = **Table**

**Description** Activate (enable) or deactivate (disable) the linearization table.

**Selection**
- Disable
- Enable

**Factory setting** Disable

**Additional information**

**Meaning of the options**
- **Disable**
  The measured level is not linearized.
  If **Linearization type (→ 152)** = **Table** at the same time, the device issues error message F435.
- **Enable**
  The measured level is linearized according to the table.

When editing the table, the **Activate table** parameter is automatically reset to **Disable** and must be reset to **Enable** after the table has been entered.

**"Safety settings" submenu**

*Navigation* Setup → Advanced setup → Safety settings

## Output echo lost

**Navigation** Setup → Advanced setup → Safety settings → Output echo lost

**Description** Output signal in case of a lost echo.

**Selection**
- Last valid value
- Ramp at echo lost
- Value echo lost
- Alarm

**Factory setting** Last valid value

**Additional information**

**Meaning of the options**
- **Last valid value**
  The last valid value is kept in the case of a lost echo.
- **Ramp at echo lost** [8)]
  In the case of a lost echo the output value is continously shifted towards 0% or 100%. The slope of the ramp is defined in the **Ramp at echo lost** parameter (→ 160).
- **Value echo lost** [8)]
  In the case of a lost echo the output assumes the value defined in the **Value echo lost** parameter (→ 159).
- **Alarm**
  In the case of a lost echo the device generates an alarm; see the **Failure mode** parameter

## Value echo lost

**Navigation** Setup → Advanced setup → Safety settings → Value echo lost

**Prerequisite** **Output echo lost (→ 159)** = **Value echo lost**

**Description** Output value in case of a lost echo

**User entry** 0 to 200 000.0 %

**Factory setting** 0.0 %

**Additional information** Use the unit which has been defined for the measured value output:
- without linearization: **Level unit (→ 146)**
- with linearization: **Unit after linearization (→ 153)**

8) Only visible if "Linearization type (→ 152)" = "None"

## Ramp at echo lost

**Navigation** Setup → Advanced setup → Safety settings → Ramp at echo lost

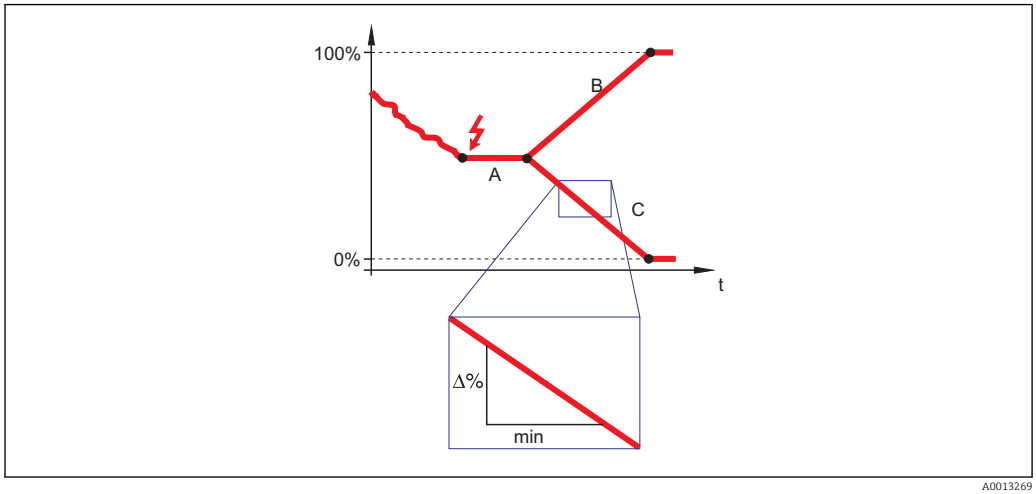
**Prerequisite** **Output echo lost (→ 159) = Ramp at echo lost**

**Description** Slope of the ramp in the case of a lost echo

**User entry** Signed floating-point number

**Factory setting** 0.0 %/min

**Additional information**




*A Delay time echo lost*
*B Ramp at echo lost (→ 160) (positive value)*
*C Ramp at echo lost (→ 160) (negative value)*

- The unit for the slope of the ramp is "percentage of the measuring range per minute" (%/min).
- For a negative slope of the ramp: The measured value is continuously decreased until it reaches 0%.
- For a positive slope of the ramp: The measured value is continuosly increased until it reaches 100%.

## Blocking distance

**Navigation** Setup → Advanced setup → Safety settings → Blocking distance

**Description** Specify blocking distance BD.

**User entry** 0 to 200 m

**Factory setting** FMR50, FMR51, FMR53, FMR54: antenna length

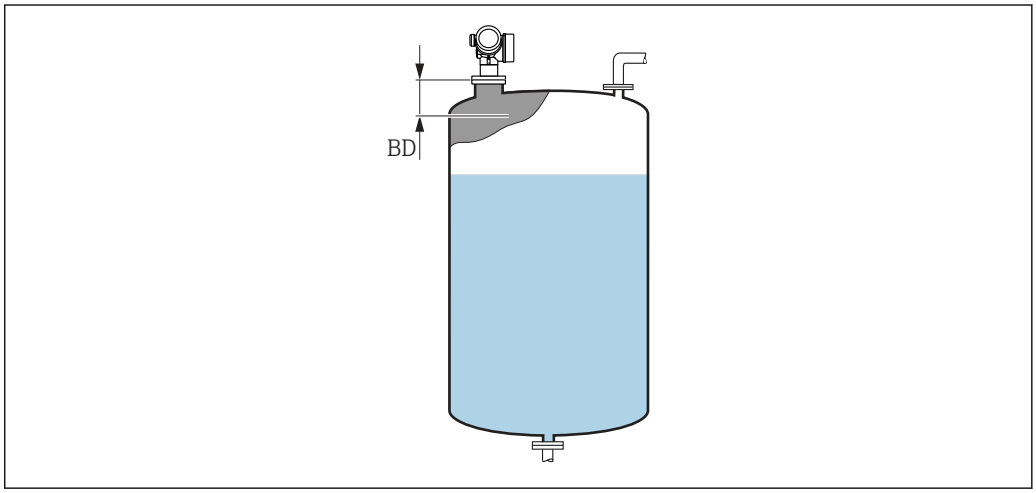
**Additional information** Signals in the blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance due to a

level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

This behavior is only valid if the following two conditions are met:
- Expert → Sensor → Echo tracking → Evaluation mode = **Short time history** or **Long time history**
- Expert → Sensor → Gas phase compensation → GPC mode= **On**, **Without correction** or **External correction**

If one of these conditions is not met, signals in the blocking distance will always be ignored.

If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.




41 *Blocking distance (BD) for liquid measurements*

### "Switch output" submenu

The **Switch output** submenu (→ 162) is only visible for devices with switch output. [9)]

*Navigation* Setup → Advanced setup → Switch output

## Switch output function

**Navigation** Setup → Advanced setup → Switch output → Switch output function

**Description** Select function for switch output.

**Selection**
- Off
- On
- Diagnostic behavior
- Limit
- Digital Output

**Factory setting** Off

**Additional information**

**Meaning of the options**
- **Off**
  The output is always open (non-conductive).
- **On**
  The output is always closed (conductive).
- **Diagnostic behavior**
  The output is normally closed and is only opened if a diagnostic event is present. The **Assign diagnostic behavior** parameter (→ 163) determines for which type of event the output is opened.
- **Limit**
  The output is normally closed and is only opened if a measured variable exceeds or falls below a defined limit. The limit values are defined by the following parameters:
  – **Assign limit (→ 163)**
  – **Switch-on value (→ 164)**
  – **Switch-off value (→ 165)**
- **Digital Output**
  The switching state of the output tracks the output value of a DI function block. The function block is selected in the **Assign status** parameter (→ 162).

The **Off** and **On** options can be used to simulate the switch output.

## Assign status

**Navigation** Setup → Advanced setup → Switch output → Assign status

**Prerequisite** **Switch output function (→ 162)** = **Digital Output**

**Description** Select device status for switch output.

9) Ordering feature 020 "Power supply; Output", option B, E or G

**Selection**
- Off
- Digital output AD 1
- Digital output AD 2
- Digital output 1
- Digital output 2
- Digital output 3
- Digital output 4
- Digital output 5
- Digital output 6
- Digital output 7
- Digital output 8

**Factory setting** Off

**Additional information** The **Digital output AD 1** and **Digital output AD 2** options refer to the Advanced Diagnostic Blocks. A switch signal generated in these blocks can be transmitted via the switch output.

## Assign limit

**Navigation** Setup → Advanced setup → Switch output → Assign limit

**Prerequisite** **Switch output function (→ 162)** = **Limit**

**Selection**
- Off
- Level linearized
- Distance
- Terminal voltage
- Electronic temperature
- Relative echo amplitude
- Area of incoupling

**Factory setting** Off

## Assign diagnostic behavior

**Navigation** Setup → Advanced setup → Switch output → Assign diagnostic behavior

**Prerequisite** **Switch output function (→ 162)** = **Diagnostic behavior**

**Description** Select diagnostic behavior for switch output.

**Selection**
- Alarm
- Alarm or warning
- Warning

**Factory setting** Alarm

## Switch-on value

**Navigation** Setup → Advanced setup → Switch output → Switch-on value

**Prerequisite** **Switch output function (→ 162) = Limit**

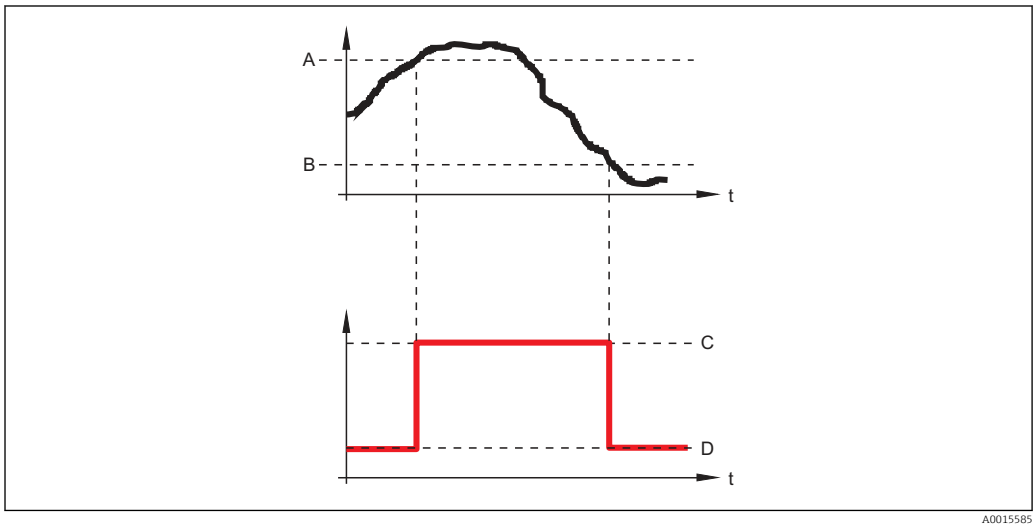
**Description** Enter measured value for the switch-on point.

**User entry** Signed floating-point number

**Factory setting** 0

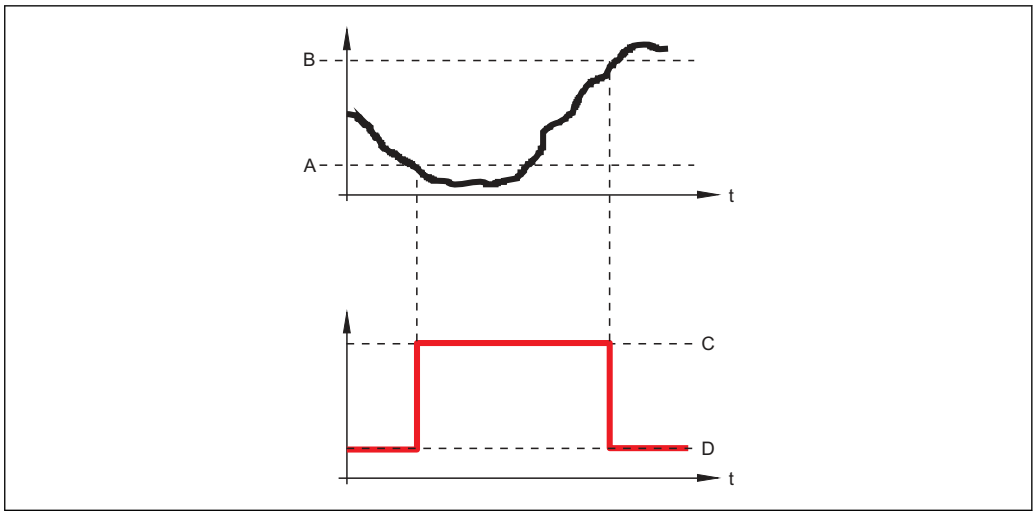
**Additional information** The switching behavior depends on the relative position of the **Switch-on value** and **Switch-off value** parameters:

**Switch-on value > Switch-off value**
– The output is closed if the measured value is larger than **Switch-on value**.
– The output is opened if the measured value is smaller than **Switch-off value**.




*A Switch-on value*
*B Switch-off value*
*C Output closed (conductive)*
*D Output opened (non-conductive)*

**Switch-on value < Switch-off value**
– The output is closed if the measured value is smaller than **Switch-on value**.
– The output is opened if the measured value is larger than **Switch-off value**.




*A Switch-on value*
*B Switch-off value*
*C Output closed (conductive)*
*D Output opened (non-conductive)*

## Switch-on delay

**Navigation** Setup → Advanced setup → Switch output → Switch-on delay

**Prerequisite**
- **Switch output function (→ 162) = Limit**
- **Assign limit (→ 163) ≠ Off**

**Description** Define delay for the switch-on of status output.

**User entry** 0.0 to 100.0 s

**Factory setting** 0.0 s

## Switch-off value

**Navigation** Setup → Advanced setup → Switch output → Switch-off value

**Prerequisite** **Switch output function (→ 162) = Limit**

**Description** Enter measured value for the switch-off point.

**User entry** Signed floating-point number

**Factory setting** 0

**Additional information** The switching behavior depends on the relative position of the **Switch-on value** and **Switch-off value** parameters; description: see the **Switch-on value** parameter (→ 164).

### Switch-off delay

**Navigation** Setup → Advanced setup → Switch output → Switch-off delay

**Prerequisite**
- **Switch output function (→ 162)** = **Limit**
- **Assign limit (→ 163)** ≠ **Off**

**Description** Define delay for the switch-off of status output.

**User entry** 0.0 to 100.0 s

**Factory setting** 0.0 s

### Failure mode

**Navigation** Setup → Advanced setup → Switch output → Failure mode

**Prerequisite** **Switch output function (→ 162)** = **Limit** or **Digital Output**

**Description** Define output behavior in alarm condition.

**Selection**
- Actual status
- Open
- Closed

**Factory setting** Open

**Additional information**

### Switch status

**Navigation** Setup → Advanced setup → Switch output → Switch status

**Description** Shows the current switch output status.

### Invert output signal

**Navigation** Setup → Advanced setup → Switch output → Invert output signal

**Description** Invert the output signal.

**Selection**
- No
- Yes

**Factory setting** No

**Additional information**

**Meaning of the options**

- **No**
  The behavior of the switch output is as described above.
- **Yes**
  The states **Open** and **Closed** are inverted as compared to the description above.

### "Display" submenu

The **Display** submenu is only visible if a display module is connected to the device.

*Navigation* Setup → Advanced setup → Display

## Language

**Navigation** Setup → Advanced setup → Display → Language

**Description** Set display language.

**Selection**
- English
- Deutsch *
- Français *
- Español *
- Italiano *
- Nederlands *
- Portuguesa *
- Polski *
- русский язык (Russian) *
- Svenska *
- Türkçe *
- 中文 (Chinese) *
- 日本語 (Japanese) *
- 한국어 (Korean) *
- Bahasa Indonesia *
- tiếng Việt (Vietnamese) *
- čeština (Czech) *

**Factory setting** The language selected in feature 500 of the product structure.
If no language has been selected: **English**

**Additional information**

## Format display

**Navigation** Setup → Advanced setup → Display → Format display

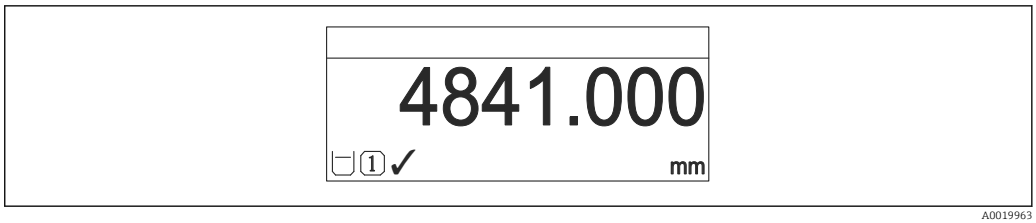
**Description** Select how measured values are shown on the display.

**Selection**
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

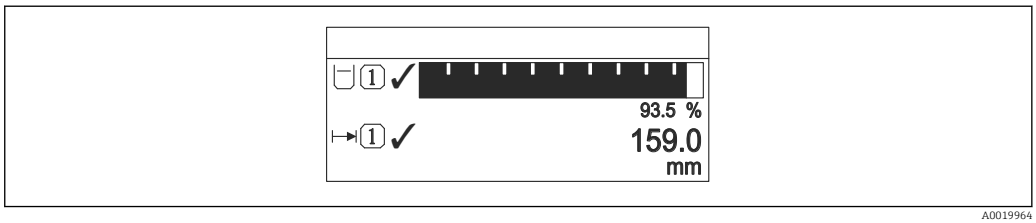
**Factory setting** 1 value, max. size

* Visibility depends on order options or device settings

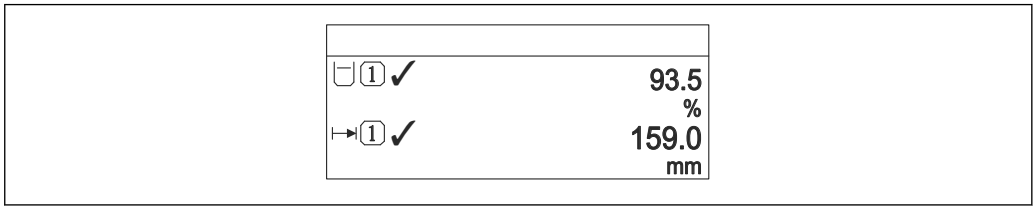
## Additional information



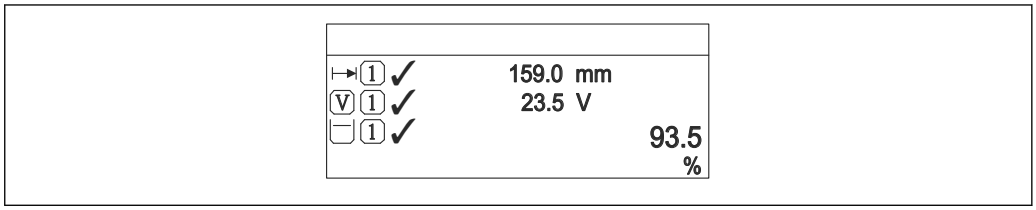

42 *"Format display" = "1 value, max. size"*



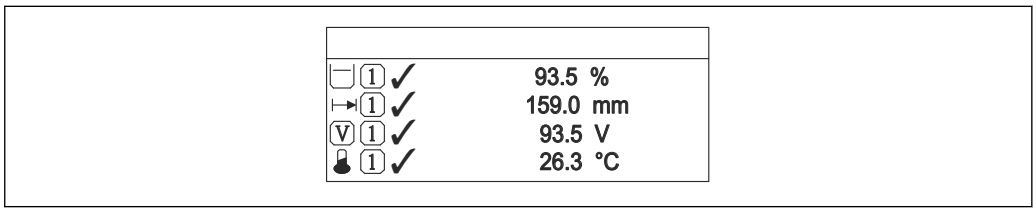

43 *"Format display" = "1 bargraph + 1 value"*




44 *"Format display" = "2 values"*




45 *"Format display" = "1 value large + 2 values"*




46 *"Format display" = "4 values"*

- The **Value 1 to 4 display** → 170 parameters specify which measured values are shown on the display and in which order.
- If more measured values are specified than the current display mode permits, the values alternate on the device display. The display time until the next change is configured in the **Display interval** parameter (→ 171).

## Value 1 to 4 display

**Navigation** Setup → Advanced setup → Display → Value 1 display

**Description** Select the measured value that is shown on the local display.

**Selection**
- Level linearized
- Distance
- Terminal voltage
- Electronic temperature
- Absolute echo amplitude
- Relative echo amplitude
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4
- Analog output 5
- Analog output 6
- Analog output 7
- Analog output 8
- Area of incoupling

**Factory setting**
- Value 1 display: Level linearized
- Value 2 display: None
- Value 3 display: None
- Value 4 display: None

## Decimal places 1 to 4

**Navigation** Setup → Advanced setup → Display → Decimal places 1

**Description** Select the number of decimal places for the display value.

**Selection**
- x
- x.x
- x.xx
- x.xxx
- x.xxxx

**Factory setting** x.xx

**Additional information** The setting does not affect the measuring or computational accuracy of the device.

## Display interval

**Navigation** Setup → Advanced setup → Display → Display interval

**Description** Set time measured values are shown on display if display alternates between values.

**User entry** 1 to 10 s

**Factory setting** 5 s

**Additional information** This parameter is only relevant if the number of selected measuring values exceeds the number of values the selected display format can display simultaneously.

## Display damping

**Navigation** Setup → Advanced setup → Display → Display damping

**Description** Set display reaction time to fluctuations in the measured value.

**User entry** 0.0 to 999.9 s

**Factory setting** 0.0 s

## Header

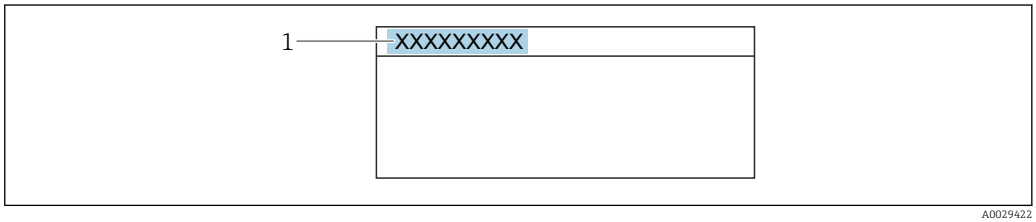
**Navigation** Setup → Advanced setup → Display → Header

**Description** Select header contents on local display.

**Selection**
- Device tag
- Free text

**Factory setting** Device tag

**Additional information**




*1 Position of the header text on the display*

*Meaning of the options*

- **Device tag**
  Is defined in the **Device tag** parameter
- **Free text**
  Is defined in the **Header text** parameter (→ 172)

## Header text

**Navigation** Setup → Advanced setup → Display → Header text

**Prerequisite** **Header (→ 171) = Free text**

**Description** Enter display header text.

**Factory setting** ----------

**Additional information** The number of characters which can be displayed depends on the characters used.

## Separator

**Navigation** Setup → Advanced setup → Display → Separator

**Description** Select decimal separator for displaying numerical values.

**Selection**
- .
- ,

**Factory setting** .

## Number format

**Navigation** Setup → Advanced setup → Display → Number format

**Description** Choose number format for the display.

**Selection**
- Decimal
- ft-in-1/16"

**Factory setting** Decimal

**Additional information** The **ft-in-1/16"** option is only valid for distance units.

## Decimal places menu

**Navigation** Setup → Advanced setup → Display → Decimal places menu

**Description** Select number of decimal places for the representation of numbers within the operating menu.

**Selection**
- x
- x.x
- x.xx
- x.xxx
- x.xxxx

**Factory setting**
x.xxxx

**Additional information**
- Is only valid for numbers in the operating menu (e.g. **Empty calibration**, **Full calibration**), but not for the measured value display. The number of decimal places for the measured value display is defined in the **Decimal places 1 to 4** → 170 parameters.
- The setting does not affect the accuracy of the measurement or the calculations.

## Backlight

**Navigation**
Setup → Advanced setup → Display → Backlight

**Prerequisite**
The device has the SD03 local display (with optical keys).

**Description**
Switch the local display backlight on and off.

**Selection**
- Disable
- Enable

**Factory setting**
Disable

**Additional information**
**Meaning of the options**
- **Disable**
  Switches the backlight off.
- **Enable**
  Switches the backlight on.

Regardless of the setting in this parameter the backlight may be automatically switched off by the device if the supply voltage is too low.

## Contrast display

**Navigation**
Setup → Advanced setup → Display → Contrast display

**Description**
Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle).

**User entry**
20 to 80 %

**Factory setting**
Dependent on the display.

**Additional information**
Setting the contrast via push-buttons:
- Darker: press the ⊖ E buttons simultaneously.
- Brighter: press the ⊕ E buttons simultaneously.

### "Configuration backup display" submenu

This submenu is only visible if a display module is connected to the device.

The configuration of the device can be saved to the display module at a certain point of time (backup). The saved configurateion can be restored to the device if required, e.g. in order to bring the device back into a defined state. The configuration can also be transferred to a different device of the same type using the display module.

*Navigation* Setup → Advanced setup → Configuration backup display

### Operating time

**Navigation** Setup → Advanced setup → Configuration backup display → Operating time

**Description** Indicates how long the device has been in operation.

**Additional information** *Maximum time*

9 999 d ( ≈ 27 years)

### Last backup

**Navigation** Setup → Advanced setup → Configuration backup display → Last backup

**Description** Indicates when the last data backup was saved to the display module.

### Configuration management

**Navigation** Setup → Advanced setup → Configuration backup display → Configuration management

**Description** Select action for managing the device data in the display module.

**Selection**
- Cancel
- Execute backup
- Restore
- Duplicate
- Compare
- Clear backup data
- Display incompatible

**Factory setting** Cancel

**Additional information**

**Meaning of the options**

- **Cancel**
  No action is executed and the user exits the parameter.
- **Execute backup**
  A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device.
- **Restore**
  The last backup copy of the device configuration is copied from the display module to the HistoROM of the device.
- **Duplicate**
  The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point are **not** included in the transmitted configuration:
  Medium type
- **Compare**
  The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the **Comparison result** parameter (→ 175).
- **Clear backup data**
  The backup copy of the device configuration is deleted from the display module of the device.

While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

If an existing backup is restored to a different device using the **Restore** option, it may occur that some device functionalities are no longer available. In some cases even a device reset will not restore the original status.

In order to transmit a configuration to a different device, the **Duplicate** option should always be used.

## Backup state

**Navigation** Setup → Advanced setup → Configuration backup display → Backup state

**Description** Displays which backup action is currently in progress.

## Comparison result

**Navigation** Setup → Advanced setup → Configuration backup display → Comparison result

**Description** Comparison between present device data and display backup.

**Additional information**

**Meaning of the display options**

- **Settings identical**
  The current device configuration of the HistoROM is identical to the backup copy in the display module.
- **Settings not identical**
  The current device configuration of the HistoROM is not identical to the backup copy in the display module.
- **No backup available**
  There is no backup copy of the device configuration of the HistoROM in the display module.
- **Backup settings corrupt**
  The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module.
- **Check not done**
  The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.
- **Dataset incompatible**
  The data sets are incompatible and can not be compared.

To start the comparison, set **Configuration management (→ 174)** = **Compare**.

If the transmitter configuration has been duplicated from a different device by **Configuration management (→ 174)** = **Duplicate**, the new device configuration in the HistoROM is only partially identical to the configuration stored in the display module: Sensor specific properties (e.g. the mapping curve) are not duplicated. Thus, the result of the comparison will be **Settings not identical**.

### "Administration" submenu

*Navigation* Setup → Advanced setup → Administration

## Define access code

**Navigation** Setup → Advanced setup → Administration → Define access code

**Description** Define release code for write access to parameters.

**User entry** 0 to 9 999

**Factory setting** 0

**Additional information**

If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the configuration data of the device can then always be modified. The user is logged on in the *Maintenance* role.

The write protection affects all parameters marked with the symbol in this document. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected.

Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter (→ 142).

Please contact your Endress+Hauser Sales Center if you lose your access code.

For display operation: The new access code is only valid after it has been confirmed in the **Confirm access code** parameter (→ 179).

## Device reset

**Navigation** Setup → Advanced setup → Administration → Device reset

Setup → Advanced setup → Administration → Device reset

**Selection**

- Cancel
- To fieldbus defaults
- To factory defaults
- To delivery settings
- Of customer settings
- To transducer defaults
- Restart device

**Factory setting** Cancel

**Additional information**

**Meaning of the options**

- **Cancel**
  No action
- **To factory defaults**
  All parameters are reset to the order-code specific factory setting.
- **To delivery settings**
  All parameters are reset to the delivery setting. The delivery setting may differ from the factory default if customer specific settings have been ordered.
  This option is only visible if customer specific settings have been ordered.
- **Of customer settings**
  All customer parameters are reset to their factory setting. Service parameters, however, remain unchanged.
- **To transducer defaults**
  Every measurment-related parameter is reset to its factory setting. Service parameters and communication-related parameters, however, remain unchanged.
- **Restart device**
  The restart resets every parameter which is stored in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

*"Define access code" wizard*

The **Define access code** wizard is only available when operating via the local display. When operating via an operating tool, the **Define access code** parameter is located directly in the **Administration** submenu. The **Confirm access code** parameter is not available for operation via operating tool.

*Navigation* Setup → Advanced setup → Administration → Define access code

**Define access code**

**Navigation** Setup → Advanced setup → Administration → Define access code → Define access code

**Description** → 177

**Confirm access code**

**Navigation** Setup → Advanced setup → Administration → Define access code → Confirm access code

**Description** Confirm the entered access code.

**User entry** 0 to 9 999

**Factory setting** 0

## 17.4 "Diagnostics" menu

*Navigation* Diagnostics

### Actual diagnostics

**Navigation** Diagnostics → Actual diagnostics

**Description** Displays current diagnostic message.

**Additional information** The display consists of:
- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

If several messages are active at the same time, the messages with the highest priority is displayed.

Information on what is causing the message, and remedy measures, can be viewed via the ⓘ symbol on the display.

### Timestamp

**Navigation** Diagnostics → Timestamp

### Previous diagnostics

**Navigation** Diagnostics → Previous diagnostics

**Description** Displays the last diagnostic message which has been active before the current message.

**Additional information** The display consists of:
- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

The condition displayed may still apply. Information on what is causing the message, and remedy measures, can be viewed via the ⓘ symbol on the display.

### Timestamp

**Navigation** Diagnostics → Timestamp

### Operating time from restart

**Navigation** Diagnostics → Operating time from restart

**Description** Displays the time the device has been in operation since the last device restart.

### Operating time

**Navigation** Diagnostics → Operating time

**Description** Indicates how long the device has been in operation.

**Additional information** *Maximum time*
9 999 d ( ≈ 27 years)

### 17.4.1 "Diagnostic list" submenu

*Navigation* Diagnostics → Diagnostic list

**Diagnostics 1 to 5**

**Navigation** Diagnostics → Diagnostic list → Diagnostics 1

**Description** Display the current diagnostics messages with the highest to fifth-highest priority.

**Additional information** The display consists of:
- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

**Timestamp 1 to 5**

**Navigation** Diagnostics → Diagnostic list → Timestamp

### 17.4.2 "Event logbook" submenu

The **Event logbook** submenu is only available when operating via the local display. When operating via FieldCare, the event list can be displayed in the FieldCare function "Event List / HistoROM".

*Navigation* Diagnostics → Event logbook

**Filter options**

**Navigation** Diagnostics → Event logbook → Filter options

**Selection**
- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)

**Factory setting** All

**Additional information**
- This parameter is only used for operation via the local display.
- The status signals are categorized according to NAMUR NE 107.

**"Event list" submenu**

The **Event list** submenu displays the history of past events of the category selected in the **Filter options** parameter (→ 183). A maximum of 100 events are displayed in chronological order.

The following symbols indicate whether an event has occurred or has ended:
- : Event has occurred
- : Event has ended

Information on what is causing the message, and remedy instructions, can be viewed via the ⓘ-button.

**Display format**
- For event messages in category I: information event, event text, "recording event" symbol and time the event occurred
- For event messages in category F, M, C, S (status signal): diagnostics event, event text, "recording event" symbol and time the event occurred

*Navigation* Diagnostics → Event logbook → Event list

### 17.4.3 "Device information" submenu

*Navigation* Diagnostics → Device information

**Device tag**

**Navigation**
Diagnostics → Device information → Device tag
Diagnostics → Device information → Device tag

**Description**
Enter tag for measuring point.

**Factory setting**
FMP5x

**Serial number**

**Navigation**
Diagnostics → Device information → Serial number
Diagnostics → Device information → Serial number

**Additional information**

**Uses of the serial number**
- To identify the device quickly, e.g. when contacting Endress+Hauser.
- To obtain specific information on the device using the Device Viewer: www.endress.com/deviceviewer

The serial number is also indicated on the nameplate.

**Firmware version**

**Navigation**
Diagnostics → Device information → Firmware version
Diagnostics → Device information → Firmware version

**User interface**
xx.yy.zz

**Additional information**
For firmware versions differing only in the last two digits ("zz") there is no difference concerning functionality or operation.

## Device name

**Navigation**
- Diagnostics → Device information → Device name
- Diagnostics → Device information → Device name

## Order code

**Navigation**
- Diagnostics → Device information → Order code
- Diagnostics → Device information → Order code

**Additional information** The order code is generated from the extended roder code, which defines all device features of the product structure. In contrast, the device features can not be read directly from the order code.

## Extended order code 1 to 3

**Navigation**
- Diagnostics → Device information → Extended order code 1
- Diagnostics → Device information → Extended order code 1

**Description** Display the three parts of the extended order code.

**Additional information** The extended order code indicates the version of all the features of the product structure and thus uniquely identifies the device.

### 17.4.4 "Measured values" submenu

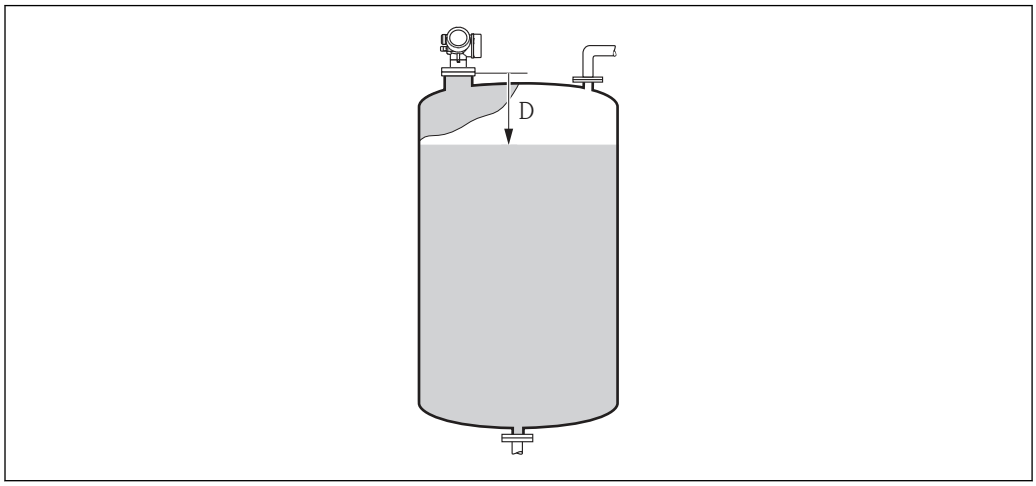
*Navigation* Diagnostics → Measured values

#### Distance

**Navigation** Diagnostics → Measured values → Distance

**Description** Displays the measured distance D between the reference point (lower edge of the flange or threaded connection) and the level.

**Additional information**




47 *Distance for liquid measurements*

The unit is defined in the **Distance unit** parameter (→ 131).

#### Level linearized

**Navigation** Diagnostics → Measured values → Level linearized

**Description** Displays linearized level.

**Additional information** The unit is defined by the **Unit after linearization** parameter → 153.

**Terminal voltage 1**

**Navigation** Diagnostics → Measured values → Terminal voltage 1

**Electronic temperature**

**Navigation** Diagnostics → Measured values → Electronic temperature

**Description** Displays the current temperature of the electronics.

**Additional information** The unit is defined in the **Temperature unit** parameter.

### 17.4.5 "Analog input 1 to 5" submenu

There is an **Analog inputs** submenu for every AI block of the device. The AI block is used to configure the measured value transmission to the bus.

Only the most basic properties of the AI block can be configured in this submenu. For a detailed configuration of the AI blocks refer to the **Expert** menu.

*Navigation* Diagnostics → Analog inputs → Analog input 1 to 5

**Block tag**

**Navigation** Diagnostics → Analog inputs → Analog input 1 to 5 → Block tag

**Description** Defined to be unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.

**Factory setting**

**Channel**

**Navigation** Diagnostics → Analog inputs → Analog input 1 to 5 → Channel

**Description** Use this function to select the input value that should be processed in the Analog Input function block.

**Selection**
- Uninitialized
- Level linearized
- Absolute echo amplitude
- Distance
- Electronic temperature

- Relative echo amplitude
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Terminal voltage

**Factory setting** Uninitialized

## Status

**Navigation** Diagnostics → Analog inputs → Analog input 1 to 5 → Status

**Description** Indicates the status of the output of the AI block according to the FOUNDATION Fieldbus specification.

## Value

**Navigation** Diagnostics → Analog inputs → Analog input 1 to 5 → Value

**Description** Indicates the output value of the AI block.

## Units index

**Navigation** Diagnostics → Analog inputs → Analog input 1 to 5 → Units index

**Description** Indicates the unit of the output value.

### 17.4.6 "Data logging" submenu

*Navigation* Diagnostics → Data logging

#### Assign channel 1 to 4

**Navigation** Diagnostics → Data logging → Assign channel 1 to 4

**Selection**
- Off
- Level linearized
- Distance
- Terminal voltage
- Electronic temperature
- Absolute echo amplitude
- Relative echo amplitude
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

**Factory setting** Off

**Additional information** A total of 1000 measured values can be logged. This means:
- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

If the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).

The logged data are deleted if a new option is selected in this parameter.

#### Logging interval

**Navigation** Diagnostics → Data logging → Logging interval

**User entry** 1.0 to 3 600.0 s

**Factory setting** 30.0 s

**Additional information** This parameter defines the interval between the individual data points in the data log, and thus the maximum loggable process time $T_{log}$:
- If 1 logging channel is used: $T_{log} = 1000 \cdot t_{log}$
- If 2 logging channels are used: $T_{log} = 500 \cdot t_{log}$
- If 3 logging channels are used: $T_{log} = 333 \cdot t_{log}$
- If 4 logging channels are used: $T_{log} = 250 \cdot t_{log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of $T_{log}$ always remains in the memory (ring memory principle).

The logged data are deleted if this parameter is changed.

*Example*

**When using 1 logging channel**
- $T_{log} = 1000 \cdot 1\ s = 1\,000\ s \approx 16.5\ min$
- $T_{log} = 1000 \cdot 10\ s = 1\,000\ s \approx 2.75\ h$
- $T_{log} = 1000 \cdot 80\ s = 80\,000\ s \approx 22\ h$
- $T_{log} = 1000 \cdot 3\,600\ s = 3\,600\,000\ s \approx 41\ d$

## Clear logging data

**Navigation** Diagnostics → Data logging → Clear logging data

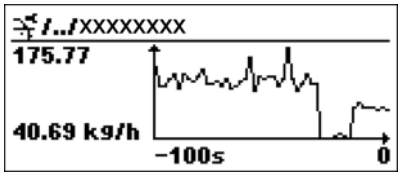
**Selection**
- Cancel
- Clear data

**Factory setting** Cancel

### "Display channel 1 to 4" submenu

The **Display channel 1 to 4** submenus are only available for operation via the local display. When operating via FieldCare, the logging diagram can be displayed in the FieldCare function "Event List / HistoROM" .

The **Display channel 1 to 4** submenus invoke a diagram of the logging history of the respective channel.




- x-axis: depending on the number of selected channels, 250 to 1000 measured values of a process variable are displayed.
- y-axis: covers the approximate measured value span and constantly adapts this to the measurement.

To return to the operating menu, press ⊞ and ⊟ simultaneaously.

*Navigation* Diagnostics → Data logging → Display channel 1 to 4

### 17.4.7 "Simulation" submenu

The **Simulation** submenu is used to simulate specific measuring values or other conditions. This helps to check the correct configuration of the device and connected control units.

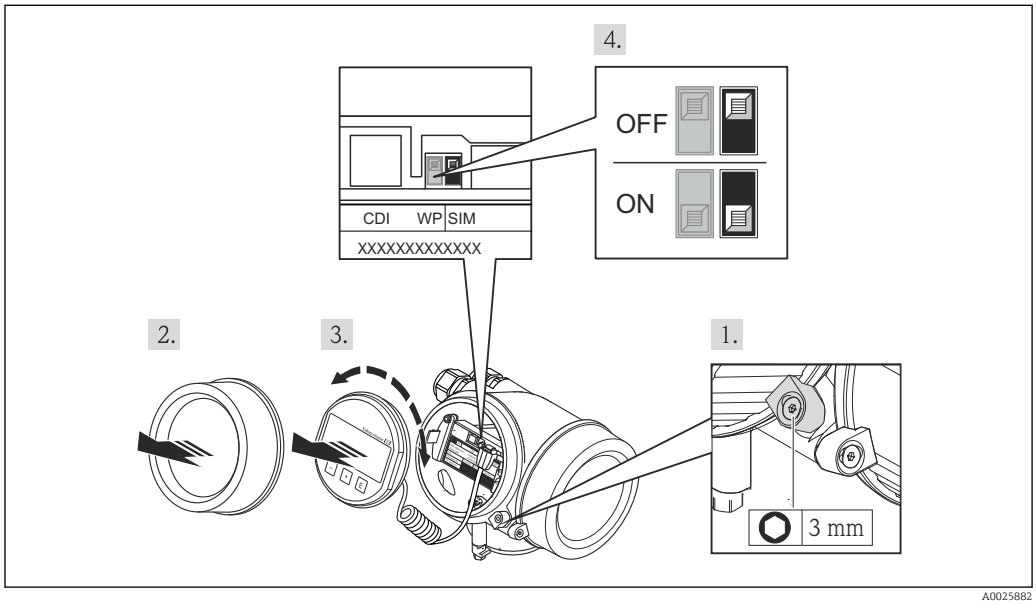
*Conditions which can be simulated*

| Condition to be simulated | Associated parameters |
|---|---|
| Specific value of a process variable | ▪ Assign measurement variable (→ 195)<br>▪ Value process variable (→ 195) |
| Specific state of the switch output | ▪ Switch output simulation (→ 195)<br>▪ Switch status (→ 196) |
| Existence of an alarm | Simulation device alarm (→ 196) |

#### Enable/disable simulation

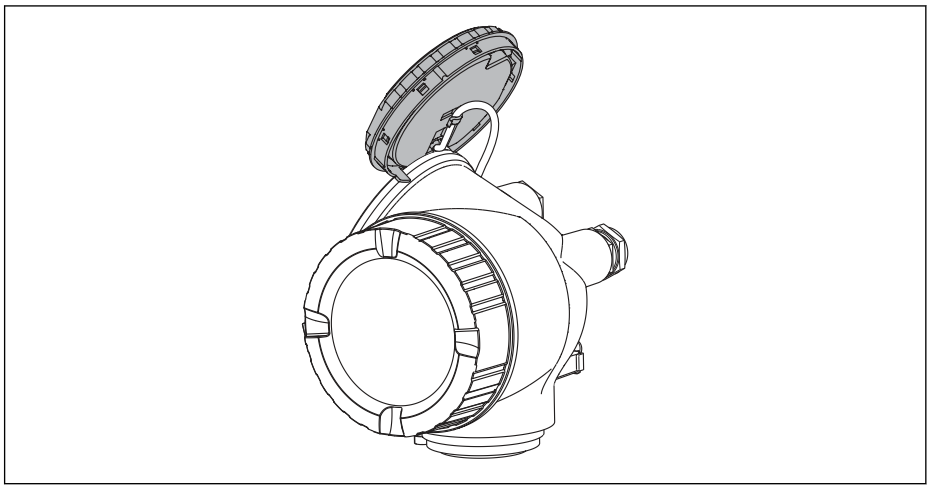
The simulation of measured values can be enabled or disabled via a hardware switch (SIM switch) at the electronics. Simulating a measured value is only possible if the SIM switch is in the ON position.

The switch output can always be simulated, irrespective of the position of the SIM switch.




1. Loosen the securing clamp.
2. Unscrew the housing cover.

3. Pull out the display module with a gentle rotation movement. To make it easier to access the SIM switch, attach the display module to the edge of the electronics compartment.
   ↳ Display module is attached to the edge of the electronics compartment.

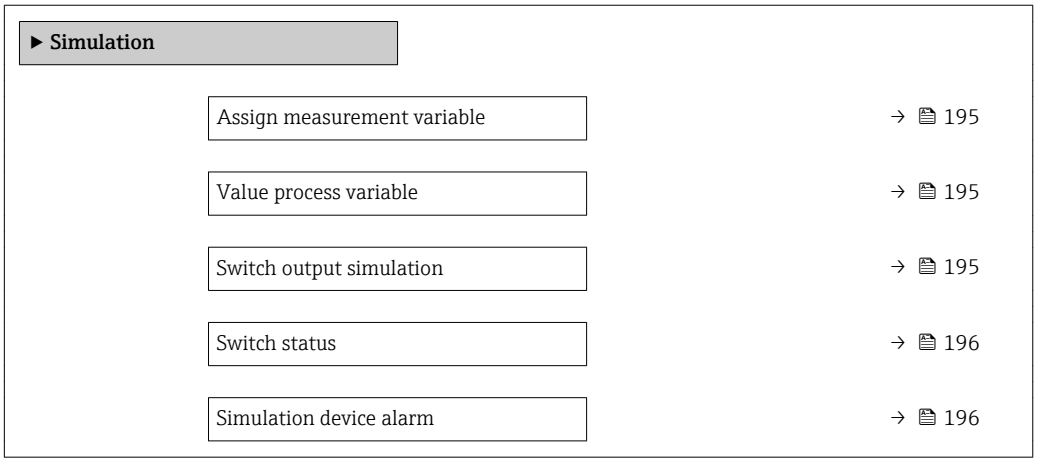


A0013909

4. SIM switch in the **ON** position: measured values can be simulated. SIM switch in the **OFF** position (factory setting): Simulation of measured values is disabled.
5. Feed the spiral cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment in the desired direction until it engages.
6. Screw the electronics compartment cover closed and tighten the securing clamp.

### Structure of the submenu

*Navigation* Expert → Diagnostics → Simulation



**Description of parameters**

*Navigation* Expert → Diagnostics → Simulation

## Assign measurement variable

**Navigation** Expert → Diagnostics → Simulation → Assign measurement variable

**Selection**
- Off
- Level
- Level linearized

**Factory setting** Off

**Additional information**
- The value of the variable to be simulated is defined in the **Value process variable** parameter (→ 195).
- If **Assign measurement variable ≠ Off**, a simulation is active. This is indicated by a diagnotic message of the *Function check (C)* category.

## Value process variable

**Navigation** Expert → Diagnostics → Simulation → Value process variable

**Prerequisite** **Assign measurement variable (→ 195) ≠ Off**

**User entry** Signed floating-point number

**Factory setting** 0

**Additional information** Downstream measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly.

## Switch output simulation

**Navigation** Expert → Diagnostics → Simulation → Switch output simulation

**Description** Switch the simulation of the switch output on and off.

**Selection**
- Off
- On

**Factory setting** Off

### Switch status

**Navigation** Expert → Diagnostics → Simulation → Switch status

**Prerequisite** **Switch output simulation (→ 195) = On**

**Description** Select the status of the status output for the simulation.

**Selection**
- Open
- Closed

**Factory setting** Open

**Additional information** The switch status assumes the value defined in this parameter. This helps to check correct operation of connected control units.

### Simulation device alarm

**Navigation** Expert → Diagnostics → Simulation → Simulation device alarm

**Description** Switch the device alarm on and off.

**Selection**
- Off
- On

**Factory setting** Off

**Additional information** When selecting the **On** option, the device generates an alarm. This helps to check the correct output behavior of the device in the case of an alarm.

An active simulation is indicated by the diagnostic message **⊗C484 Simulation failure mode**.

### Simulation diagnostic event

**Navigation** Expert → Diagnostics → Simulation → Simulation diagnostic event

**Description** Select a diagnostic event for the simulation process that is activated.

**Factory setting** Off

**Additional information** When operated via the local display, the selection list can be filtered according to the event categories (**Diagnostic event category** parameter).

### 17.4.8 "Device check" submenu

*Navigation* Diagnostics → Device check

**Start device check**

**Navigation** Diagnostics → Device check → Start device check

**Description** Start a device check.

**Selection**
- No
- Yes

**Factory setting** No

**Additional information** In the case of a lost echo a device check can not be performed.

**Result device check**

**Navigation** Diagnostics → Device check → Result device check

**Description** Displays the result of the device check.

**Additional information**

**Meaning of the display options**
- **Installation ok**
  Measurement possible without restrictions.
- **Accuracy reduced**
  A measurement is possible. However, the measuring accuracy may be reduced due to the signal amplitudes.
- **Measurement capability reduced**
  A measurement is currently possible. Howerver, there is the risk of an echo loss. Check the mounting position of the device and the dielectric constant of the medium.
- **Check not done**
  No device check has been performed.

**Last check time**

**Navigation** Diagnostics → Device check → Last check time

**Description** Displays the operating time at which the last device check has been performed.

## Level signal

**Navigation** Diagnostics → Device check → Level signal

**Prerequisite** Device check has been performed.

**Description** Displays result of the device check for the level signal.

**User interface**
- Check not done
- Check not OK
- Check OK

**Additional information** For **Level signal** = **Check not OK**: Check the mounting position of the device and the dielectric constant of the medium.

### 17.4.9 "Heartbeat" submenu

The **Heartbeat** submenu is only available via **FieldCare** or **DeviceCare**. It contains the wizards which are part of the **Heartbeat Verification** and **Heartbeat Monitoring** application packages.

**Detailed description**
SD01871F

*Navigation* Diagnostics → Heartbeat

# Index


## A

Access authorization to parameters
- Read access . . . 50
- Write access . . . 50

Access code . . . 50
- Incorrect input . . . 50

Access status display (Parameter) . . . 141
Access status tooling (Parameter) . . . 141
Accessories
- Communication specific . . . 118
- Service specific . . . 118

Activate table (Parameter) . . . 158
Actual diagnostics (Parameter) . . . 180
Administration (Submenu) . . . 177
Advanced process conditions (Parameter) . . . 145
Advanced setup (Submenu) . . . 141
Analog input 1 to 5 (Submenu) . . . 139, 187
Application . . . 11
- Residual risk . . . 11

Assign channel 1 to 4 (Parameter) . . . 189
Assign diagnostic behavior (Parameter) . . . 163
Assign limit (Parameter) . . . 163
Assign measurement variable (Parameter) . . . 195
Assign status (Parameter) . . . 162

## B

Backlight (Parameter) . . . 173
Backup state (Parameter) . . . 175
Block tag (Parameter) . . . 139, 187
Blocking distance (Parameter) . . . 146, 160

## C

CE mark . . . 12
Channel (Parameter) . . . 139, 187
Cleaning . . . 108
Clear logging data (Parameter) . . . 190
Comparison result (Parameter) . . . 175
Configuration backup display (Submenu) . . . 174
Configuration management (Parameter) . . . 174
Configuration of a level measurement . . . 77, 86
Confirm access code (Parameter) . . . 179
Confirm distance (Parameter) . . . 135, 138
Context menu . . . 61
Contrast display (Parameter) . . . 173
Customer value (Parameter) . . . 158

## D

Data logging (Submenu) . . . 189
Decimal places 1 (Parameter) . . . 170
Decimal places menu (Parameter) . . . 172
Declaration of Conformity . . . 12
Define access code . . . 50
Define access code (Parameter) . . . 177, 179
Define access code (Wizard) . . . 179
Designated use . . . 11
Device check (Submenu) . . . 197
Device information (Submenu) . . . 184
Device name (Parameter) . . . 185
Device replacement . . . 109
Device reset (Parameter) . . . 177
Device tag (Parameter) . . . 184
Diagnostic event
- In the operating tool . . . 102

Diagnostic events . . . 99
Diagnostic list . . . 103
Diagnostic list (Submenu) . . . 182
Diagnostic message . . . 99
Diagnostics
- Symbols . . . 99

Diagnostics (Menu) . . . 180
Diagnostics 1 (Parameter) . . . 182
Diagnostics event . . . 100
Diameter (Parameter) . . . 155
DIP switch
- see Write protection switch

Disable simulation . . . 192
Display (Submenu) . . . 168
Display and operating module FHX50 . . . 46
Display channel 1 to 4 (Submenu) . . . 191
Display damping (Parameter) . . . 171
Display interval (Parameter) . . . 171
Display module . . . 55
Display symbols for submenus . . . 56
Display symbols for the locking state . . . 56
Disposal . . . 110
Distance (Parameter) . . . 134, 138, 186
Distance unit (Parameter) . . . 131
Document
- Function . . . 6

Document function . . . 6

## E

Electronic temperature (Parameter) . . . 187
Electronics housing
- Design . . . 16

Empty calibration (Parameter) . . . 132
Enable simulation . . . 192
Enter access code (Parameter) . . . 142
Envelope curve display . . . 62
Event history . . . 105
Event level
- Explanation . . . 99
- Symbols . . . 99

Event list (Submenu) . . . 183
Event logbook (Submenu) . . . 183
Event text . . . 100
Events list . . . 105
Extended order code 1 (Parameter) . . . 185
Exterior cleaning . . . 108

## F

Failure mode (Parameter) . . . 166

FHX50 . . . . . 46
Filter options (Parameter) . . . . . 183
Filtering the event logbook . . . . . 106
Firmware version (Parameter) . . . . . 184
Format display (Parameter) . . . . . 168
Free text (Parameter) . . . . . 154
Full calibration (Parameter) . . . . . 133

H
Hardware write protection . . . . . 51
Header (Parameter) . . . . . 171
Header text (Parameter) . . . . . 172
Heartbeat (Submenu) . . . . . 199
HistoROM (description) . . . . . 87
Housing
Design . . . . . 16
Turning . . . . . 33

I
Input mask . . . . . 59
Intermediate height (Parameter) . . . . . 155
Invert output signal (Parameter) . . . . . 166

K
Keypad lock
Disabling . . . . . 54
Switching on . . . . . 54

L
Language (Parameter) . . . . . 168
Language selection . . . . . 85
Last backup (Parameter) . . . . . 174
Last check time (Parameter) . . . . . 197
Level (Parameter) . . . . . 134, 157, 158
Level (Submenu) . . . . . 143
Level correction (Parameter) . . . . . 147
Level linearized (Parameter) . . . . . 154, 186
Level measurement configuration . . . . . 77, 86
Level signal (Parameter) . . . . . 198
Level unit (Parameter) . . . . . 146
Linearization (Submenu) . . . . . 150, 151, 152
Linearization type (Parameter) . . . . . 152
Local display . . . . . 45
see Diagnostics message
see In alarm condition
Locking status (Parameter) . . . . . 141
Logging interval (Parameter) . . . . . 189

M
Maintenance . . . . . 108
Manage device configuration . . . . . 81, 87
Mapping (Wizard) . . . . . 138
Mapping end point (Parameter) . . . . . 136, 138
Max. draining speed liquid (Parameter) . . . . . 144
Max. filling speed liquid (Parameter) . . . . . 144
Maximum value (Parameter) . . . . . 155
Measured materials . . . . . 11
Measured value symbols . . . . . 57
Measured values (Submenu) . . . . . 186
Medium group (Parameter) . . . . . 132
Medium property (Parameter) . . . . . 143
Medium type (Parameter) . . . . . 143
Menu
Diagnostics . . . . . 180
Setup . . . . . 131

N
Number format (Parameter) . . . . . 172

O
Operating elements
Diagnostics message . . . . . 100
Operating module . . . . . 55
Operating time (Parameter) . . . . . 174, 181
Operating time from restart (Parameter) . . . . . 181
Operational safety . . . . . 12
Order code (Parameter) . . . . . 185
Output echo lost (Parameter) . . . . . 159
Overvoltage protection
General information . . . . . 40

P
Prepare recording map (Parameter) . . . . . 138
Present mapping (Parameter) . . . . . 136
Previous diagnostics (Parameter) . . . . . 180
Process Value Filter Time (Parameter) . . . . . 140
Product safety . . . . . 12

R
Ramp at echo lost (Parameter) . . . . . 160
Read access . . . . . 50
Record map (Parameter) . . . . . 137, 138
Registered trademarks . . . . . 10
Remedial measures
Calling up . . . . . 101
Closing . . . . . 101
Remote operation . . . . . 46
Repair concept . . . . . 109
Replacing a device . . . . . 109
Requirements for personnel . . . . . 11
Result device check (Parameter) . . . . . 197
Return . . . . . 110

S
Safety instructions
Basic . . . . . 11
Safety Instructions (XA) . . . . . 13
Safety settings (Submenu) . . . . . 159
Separator (Parameter) . . . . . 172
Serial number (Parameter) . . . . . 184
Service interface (CDI) . . . . . 47
Setting the operating language . . . . . 76
Settings
Manage device configuration . . . . . 81, 87
Operating language . . . . . 76
Setup (Menu) . . . . . 131
Signal quality (Parameter) . . . . . 135
SIM switch . . . . . 192
Simulation (Submenu) . . . . . 194, 195
Simulation device alarm (Parameter) . . . . . 196

Simulation diagnostic event (Parameter) . . . . . 196
Spare parts . . . . . 110
Nameplate . . . . . 110
Start device check (Parameter) . . . . . 197
Status (Parameter) . . . . . 188
Status signals . . . . . 56, 99
Submenu
Administration . . . . . 177
Advanced setup . . . . . 141
Analog input 1 to 5 . . . . . 139, 187
Configuration backup display . . . . . 174
Data logging . . . . . 189
Device check . . . . . 197
Device information . . . . . 184
Diagnostic list . . . . . 182
Display . . . . . 168
Display channel 1 to 4 . . . . . 191
Event list . . . . . 183
Event logbook . . . . . 183
Events list . . . . . 105
Heartbeat . . . . . 199
Level . . . . . 143
Linearization . . . . . 150, 151, 152
Measured values . . . . . 186
Safety settings . . . . . 159
Simulation . . . . . 194, 195
Switch output . . . . . 162
Switch output (Submenu) . . . . . 162
Switch output function (Parameter) . . . . . 162
Switch output simulation (Parameter) . . . . . 195
Switch status (Parameter) . . . . . 166, 196
Switch-off delay (Parameter) . . . . . 166
Switch-off value (Parameter) . . . . . 165
Switch-on delay (Parameter) . . . . . 165
Switch-on value (Parameter) . . . . . 164
Symbols
For correction . . . . . 59
In the text and numeric editor . . . . . 59
System components . . . . . 118

## T

Table mode (Parameter) . . . . . 156
Table number (Parameter) . . . . . 157
Tank type (Parameter) . . . . . 131
Tank/silo height (Parameter) . . . . . 147
Terminal voltage 1 (Parameter) . . . . . 187
Timestamp (Parameter) . . . . . 180, 181, 182
Transmitter
Turning the display . . . . . 34
Turning the display module . . . . . 34
Transmitter housing
Turning . . . . . 33
Trouble shooting . . . . . 97
Tube diameter (Parameter) . . . . . 132
Turning the display . . . . . 34
Turning the display module . . . . . 34

## U

Unit after linearization (Parameter) . . . . . 153
Units index (Parameter) . . . . . 188

## V

Value (Parameter) . . . . . 188
Value 1 display (Parameter) . . . . . 170
Value echo lost (Parameter) . . . . . 159
Value process variable (Parameter) . . . . . 195

## W

W@M Device Viewer . . . . . 110
Wizard
Define access code . . . . . 179
Mapping . . . . . 138
Workplace safety . . . . . 12
Write access . . . . . 50
Write protection
Via access code . . . . . 50
Via write protection switch . . . . . 51
Write protection switch . . . . . 51

## Z

Zubehör
Gerätespezifisch . . . . . 111




www.addresses.endress.com

Endress+Hauser

People for Process Automation